Customer Approval Specification

To:

Product Name: C060SWR5-1

Document Issue Date: 2019/03/14

	InfoVision Optoelectronics
SIGNATURE _____ _____ _____	**SIGNATURE** **REVIEWED BY** **CS** _____ **PREPARED BY** **FAE** _____

Note: 1. Please contact InfoVision Company. before designing your product based on this product.
2. The information contained herein is presented merely to indicate the characteristics and performance of our products. No responsibility is assumed by IVO for any intellectual property claims or other problems that may result from application based on the module described herein.

Revision	Date	Page	Old Description	New Description	Remark
V01	2017/09/05	-	-	-	-

CONTENTS

1 General Descriptions

1.1 Introduction

The C060SWR5-1 is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) Sub Sheet that uses amorphous silicon TFT as a switching device. This TFT LCD panel (Single Chip) has a 5.99 inch diagonally measured active display area with HD resolution (720 horizontal by 1,440 vertical pixels array).

1.2 Features

- 5.99 Inch TFT-LCD Panel
- Supported HD Resolution
- Compatible with RoHS Standard

1.3 General Characteristics

Table 1 General Characteristics

Item	Specification		Unit	Note
Outline Dimension (H x V x D)	70.04x141.897x0.80		mm	Single Chip
Active Area (H x V)	68.04x136.08		mm	Single Chip
Number of Pixels (H x V)	720 x 1,440		-	Single Chip
Pixel Size (H x V)	0.0945x0.0945		mm	Single Chip
Pixel Arrangement	RGB Stripe		-	-
Display Type	Transmissive		-	-
Display Mode	Normally Black		-	-
Cell Thickness	CF: 0.40±0.04		mm	Single Chip
	TFT: 0.40±0.04			
Driver IC(Recommendation)	ILI9881C		-	-
Weight	19.890(Typ.)	21.879(Max.)	g	Single Chip
	477.360(Typ.)	525.096(Max.)		Sub A
	358.020(Typ.)	393.822(Max.)		Sub B

2 Absolute Maximum Ratings

Table 2 Absolute Maximum Ratings

Item	Symbol	Min.	Max.	Unit	Conditions
LC Operating Voltage	V_{op}	-5	5	V	(1),(2),(3),(4)
Operating Temperature	T_{gs}	-20	70	℃	
Storage Temperature	T_a	-30	80	℃	
Operating Humidity	H_{op}	10	90	%RH	
Storage Humidity	H_{st}	10	90	%RH	

Note(1) All the parameters specified in the table are absolute maximum rating values that may cause faulty operation or unrecoverable damage, if exceeded. It is recommended to follow the typical value.

Note(2) All the contents of electro-optical specifications and display fineness are guaranteed under Normal Conditions. Normal conditions are defined as: Temperature: 25℃, Humidity: 55± 10%RH.

Note(3) Unpredictable results may occur when it was used in extreme conditions. T_a= Ambient Temperature, T_{gs}= Glass Surface Temperature. All the display fineness should be inspected under normal conditions.

Note(4) Wet bulb temperature should be lower than 57.8℃, and no condensation of water. Besides, protect the module from static electricity.

3 Electrical Specifications

Table 3 Electrical Specifications

No.	Item	Min.	Typ.	Max.	Unit
1	Vcom voltage	-1.27	-0.77	-0.27	V
2	Frame Rate	55	60	65	Hz
3	VGH voltage	14	15	16	V
4	VGL voltage	-12	-11	-10	V

Note(1) Both VGH and VGL are TFT gate operation voltage.

Note(2) The setting of electrical parameters should follow the initial code specified by IVO. Vcom must be adjusted to optimize display quality.

Note(3) All the contents of electrical specifications and display fineness are guaranteed under Normal Conditions. Normal conditions are defined as follow: Temperature: 25℃, Humidity: 55± 10%RH.

4 Optical Characteristics

The optical characteristics are measured under stable conditions as following notes.

Table 4 Optical Characteristics

Item	Conditions		Min.	Typ.	Max.	Unit	Note
Transmittance	Center		3.5	3.9	-	%	Under C-light (1),(5),(7),(8),(10) θx=θy=0°
Contrast Ratio	Center		1000	1200	-	-	(1),(3),(6),(7),(8) θx=θy=0°
Response Time	Rising + Falling		-	35	40	ms	(1),(4),(6),(7),(8) θx=θy=0°
CF Color Chromaticity (CIE1931)	Red x		Typ -0.03	0.657	Typ +0.03	-	Under C-light (1),(5),(8) θx=θy=0°
	Red y			0.322		-	
	Green x			0.276		-	
	Green y			0.599		-	
	Blue x			0.137		-	
	Blue y			0.101		-	
	White x			0.298		-	
	White y			0.334		-	
NTSC	CIE1931		68	70	-	%	
Viewing Angle (CR≥10)	Horizontal	θ_{x+}	80	85	-	degree	(1),(2),(6),(7),(8)
		θ_{x-}	80	85	-		
	Vertical	θ_{y+}	80	85	-		
		θ_{y-}	80	85	-		

Note(1) Measurement Setup:

The LCD module should be stabilized at given ambient temperature (25°C) for 30 minutes to avoid abrupt temperature changing during measuring. In order to stabilize the luminance, the measurement should be executed after lighting backlight for 30 minutes in the windless room.

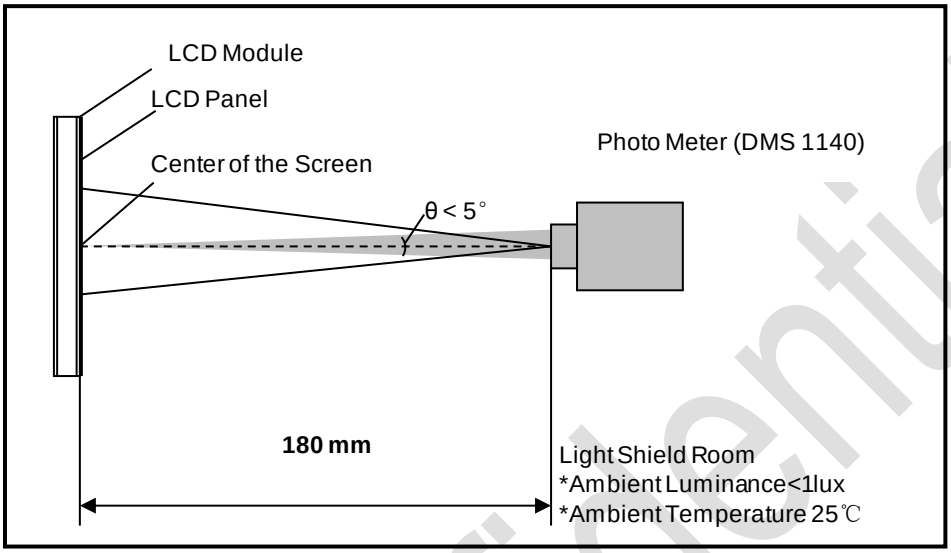


Figure 1 Optical Characteristic Measurement Equipment and Method

Note(2) Definition of Viewing Angle.

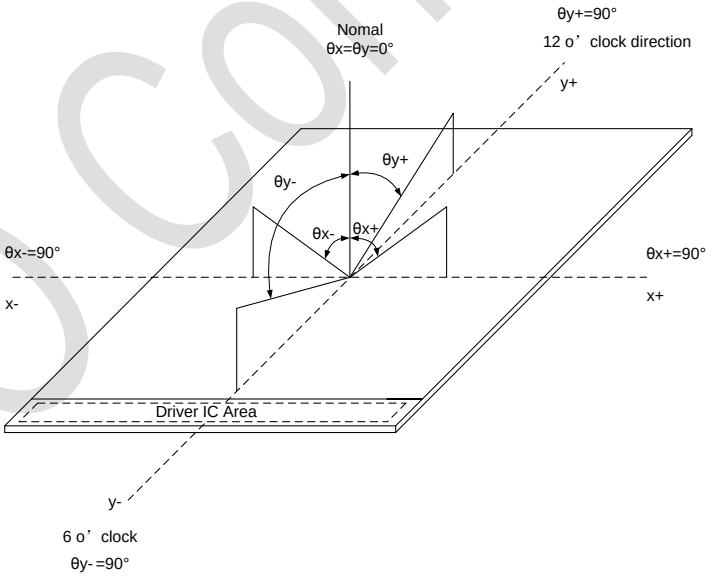


Figure 2 Definition of Viewing Angle

Note(3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression:

$$\text{Contrast Ratio (CR)} = \frac{L_{255}}{L_0}$$

L_{255}: Luminance of gray level 255, L_0: Luminance of gray level 0

Note(4) Definition of Response Time

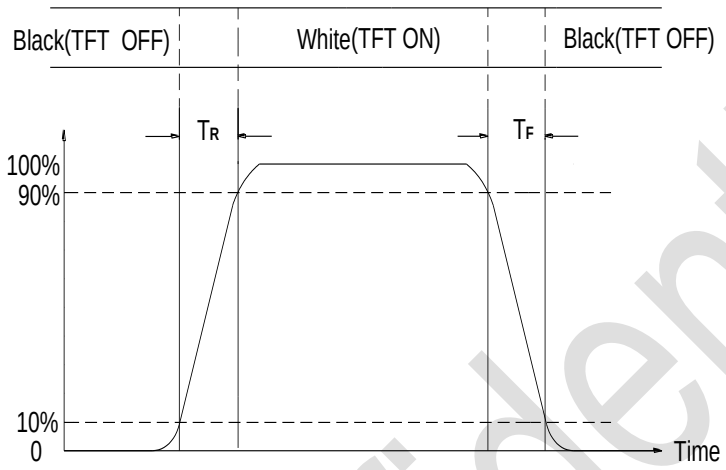


Figure 3 Definition of Response Time

Note(5) C-light Spectrum

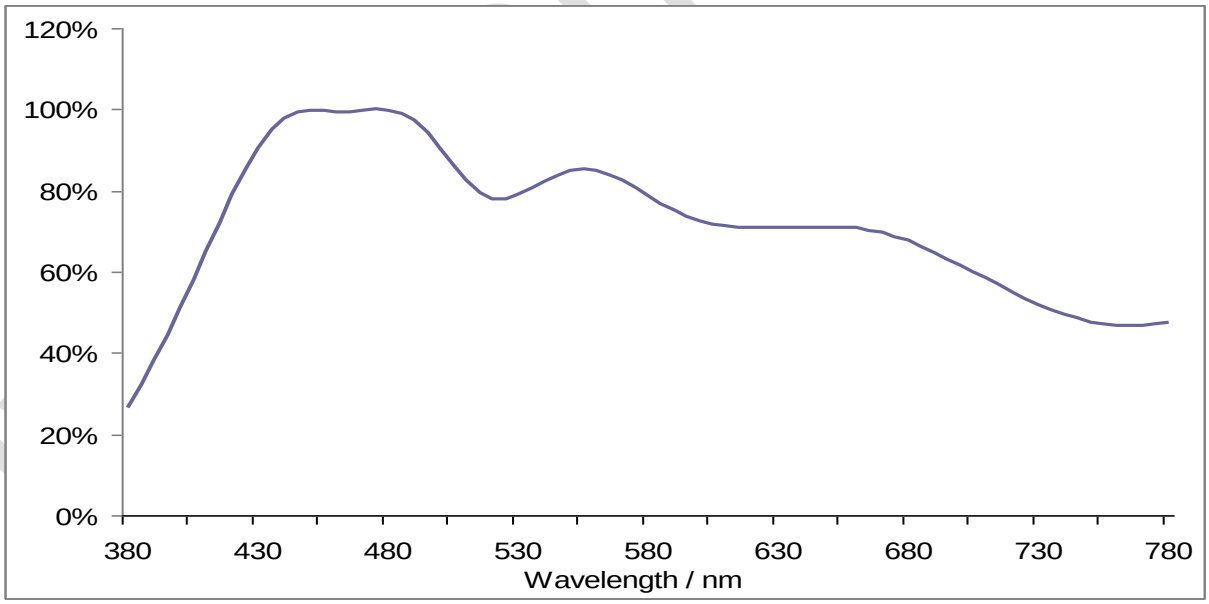


Figure 4 C-Light Spectrum

Note(6) The Back Light Spectrum.

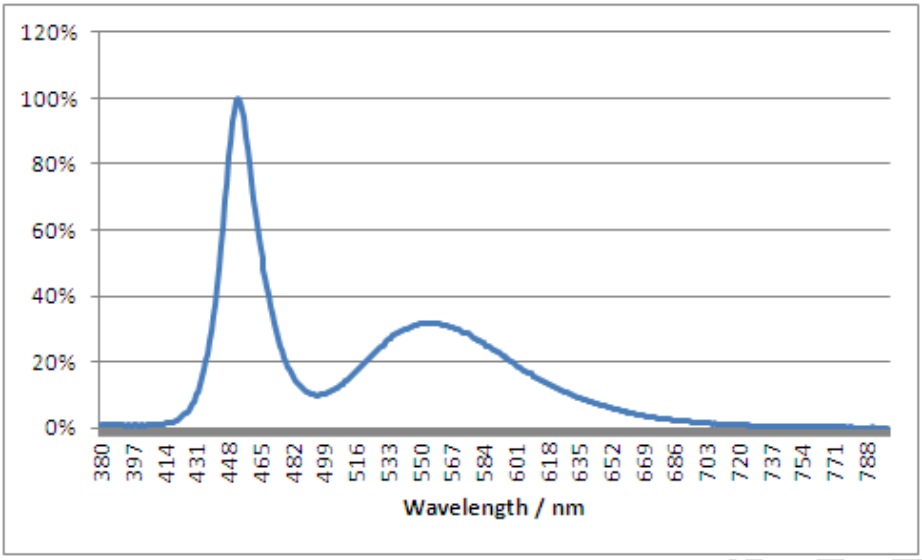


Figure 5 Back Light Spectrum

Note(7) The polarizer type: SLP-5115AS-10-T-S11/CF; SLP-5115-10-T-S11/TFT.

Note(8) All optical data are based on IVO given system & nominal parameter & testing machine in this document.

Note(9) The direction of polarizer. It is recommended that customer should choose O Mode or E Mode according to the actual situation.

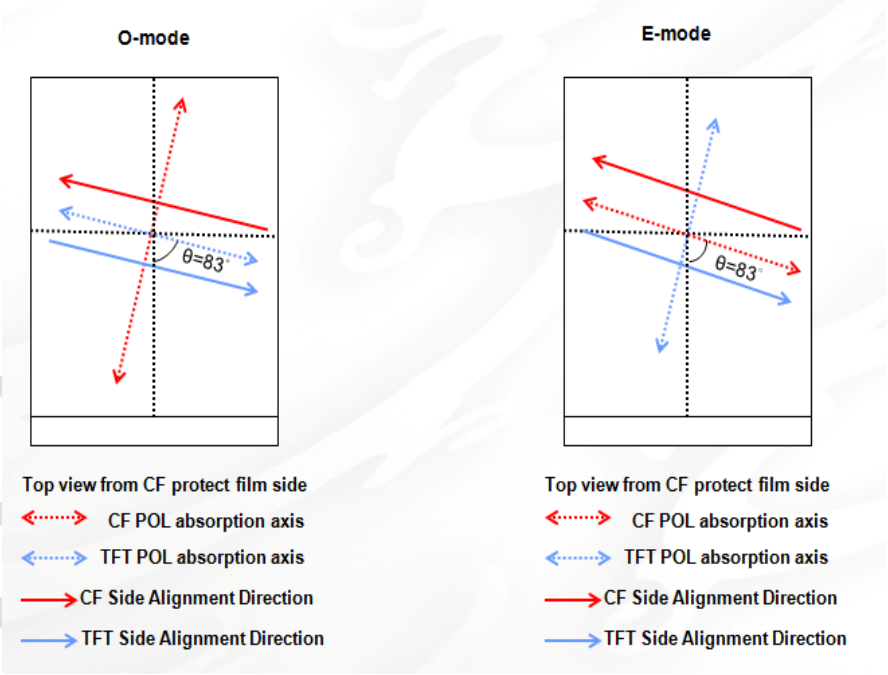


Figure 6 Polarizer Direction

Note(10) Considering each custom's spectrum of BL is different,we define transmittance spec based on C-light source（standard light source）.The differences may exist,when measure transmittance with unlike BL spectrum.if you have any questions,please contact IVO FAE

5 Pixel Format

The figure shows the relation of the input signals and LCD panel pixel format.

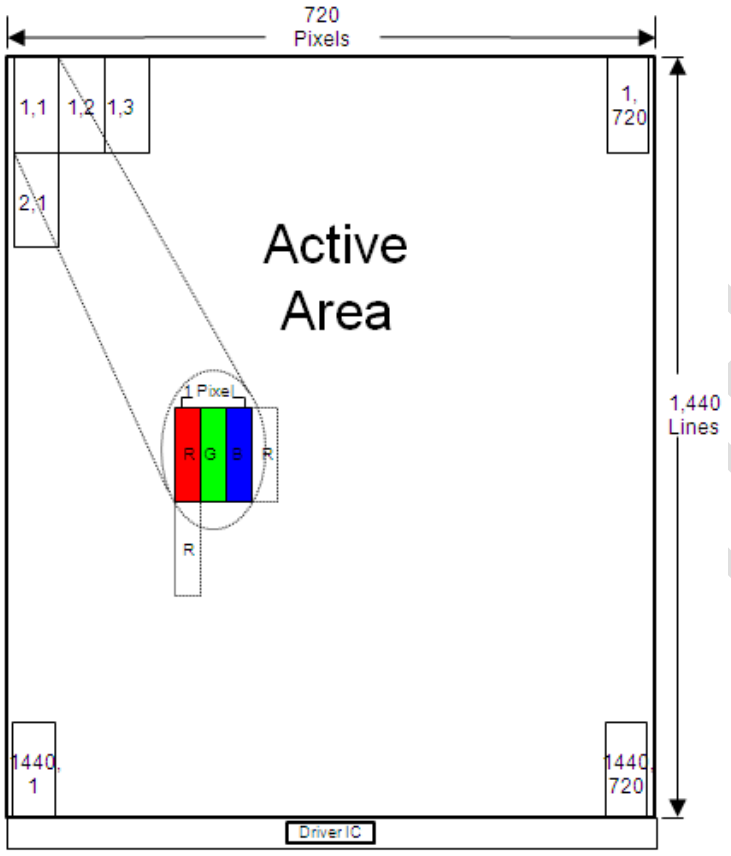
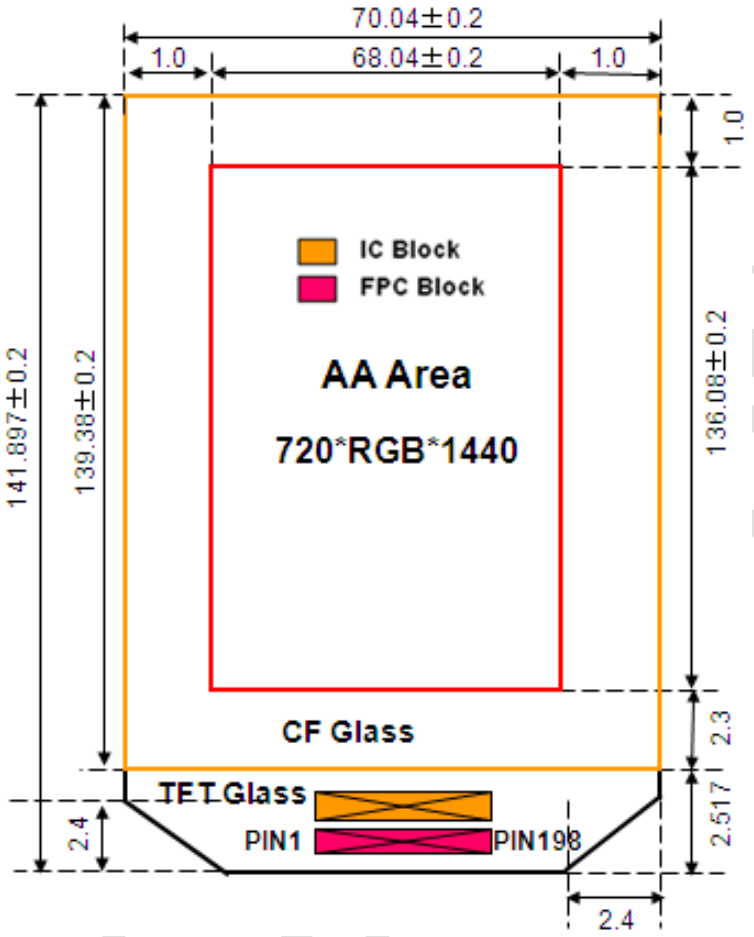


Figure 7 Pixel Format

6 Outline Size

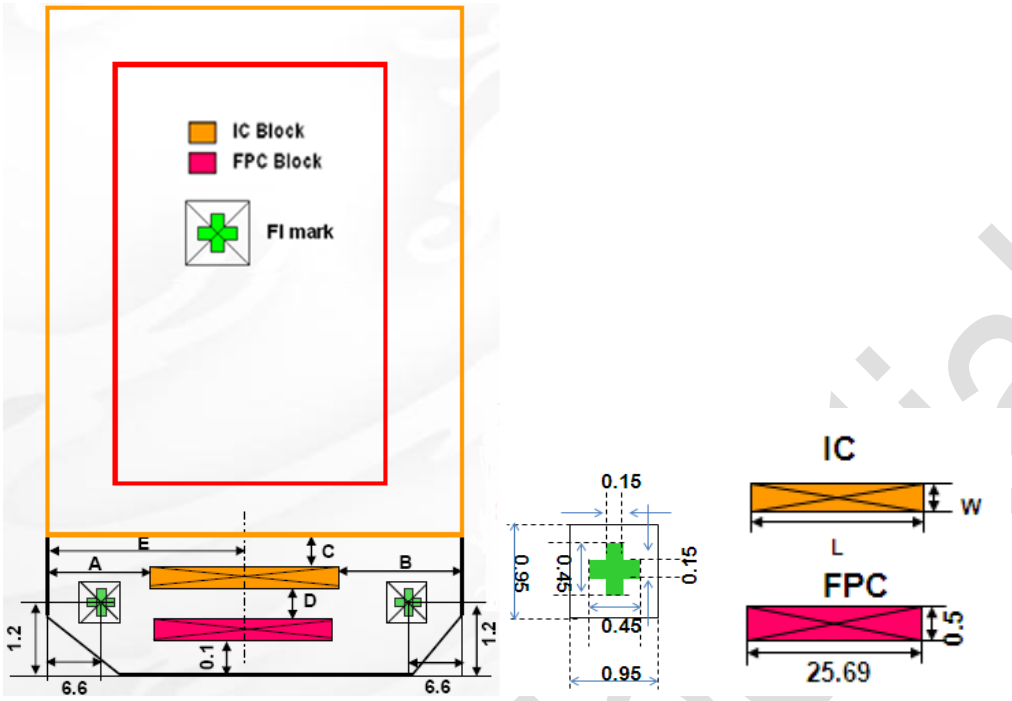
6.1 Outline Size of Single Chip



Unit: mm

Figure 8 Outline Size of Single Chip

6.2 IC & FPC Position on Cell

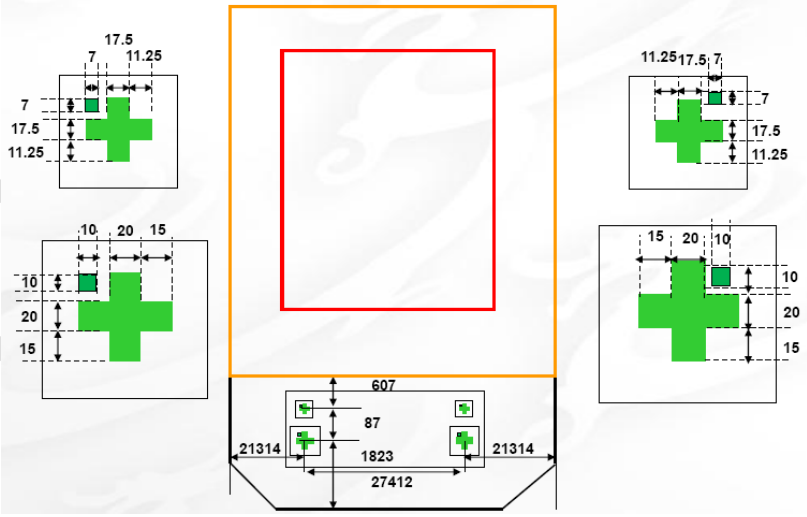


Unit: mm

Figure 9 IC and FPC Position Information

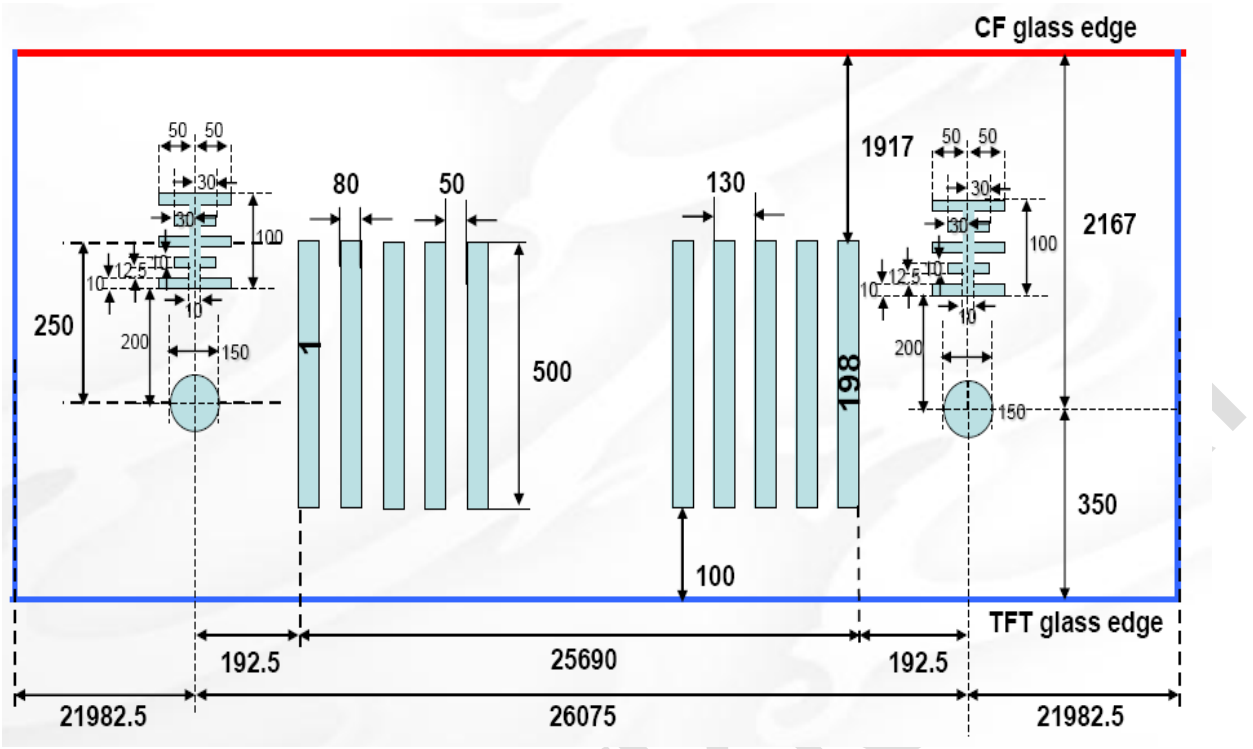
Table 5 IC Position Information

IC Name	L(mm)	W(mm)	A(mm)	B(mm)	C(mm)	D(mm)	E(mm)
ILI9881C	27.84	0.875	21.10	21.10	0.542	0.500	35.02



Unit: um

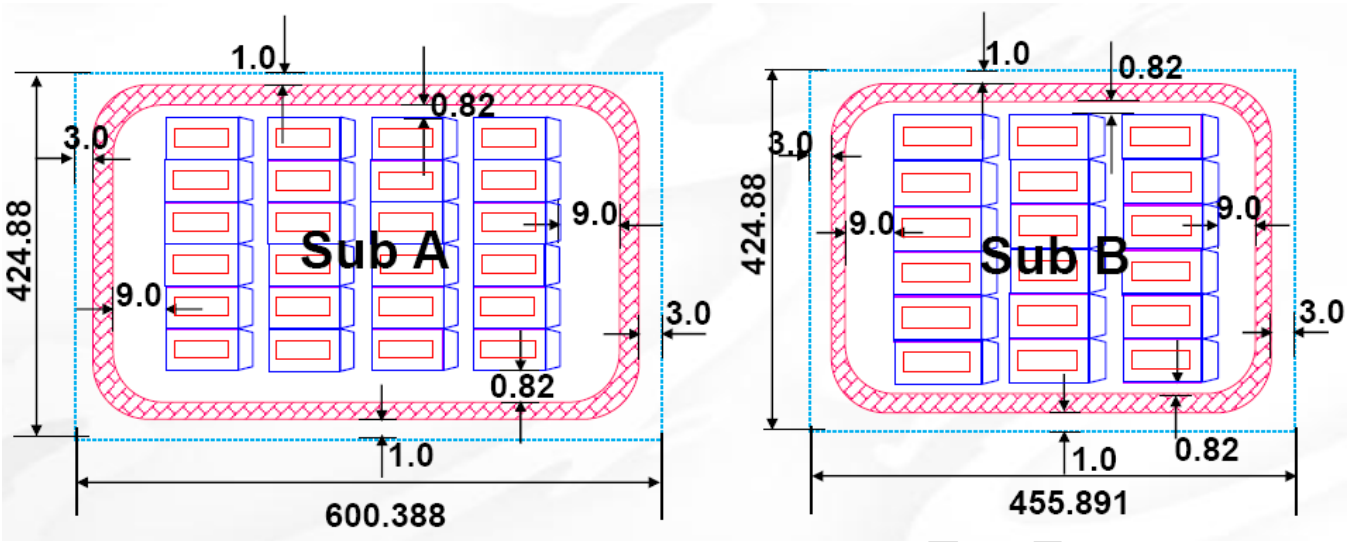
Figure 10 IC Position Information



Unit: um

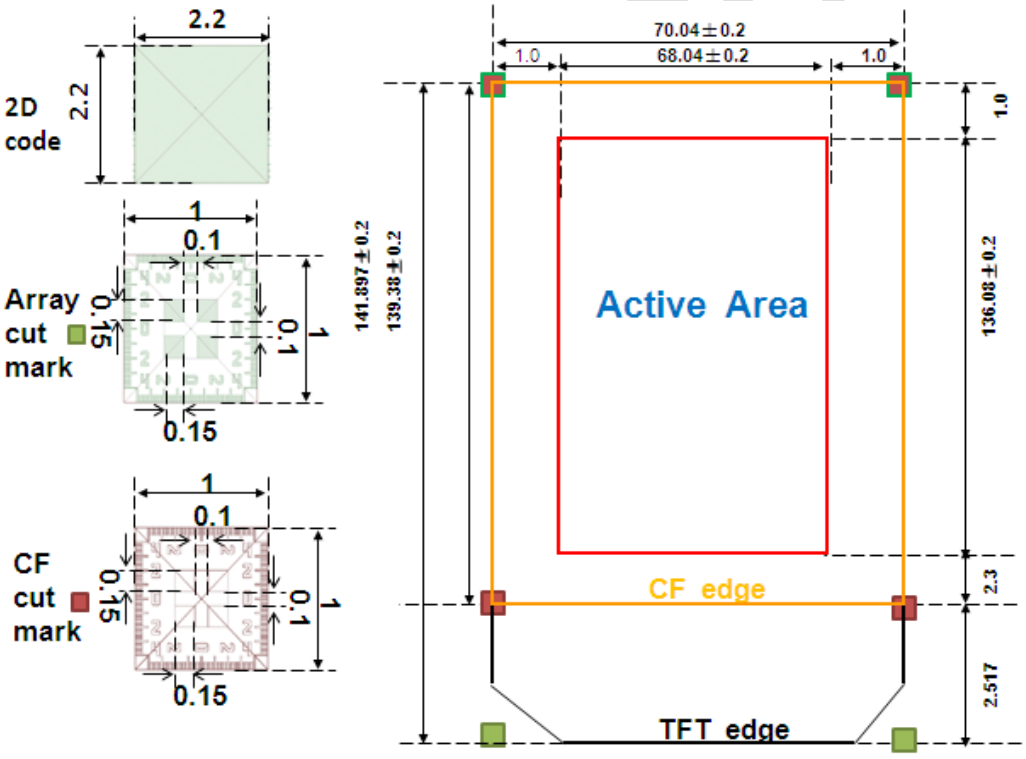
Figure 11 FPC Position Information

6.3 Outline Size of Sub Sheet and Cut Mark



Unit: mm

Figure 12 Outline Size of Sub Sheet



Unit: mm

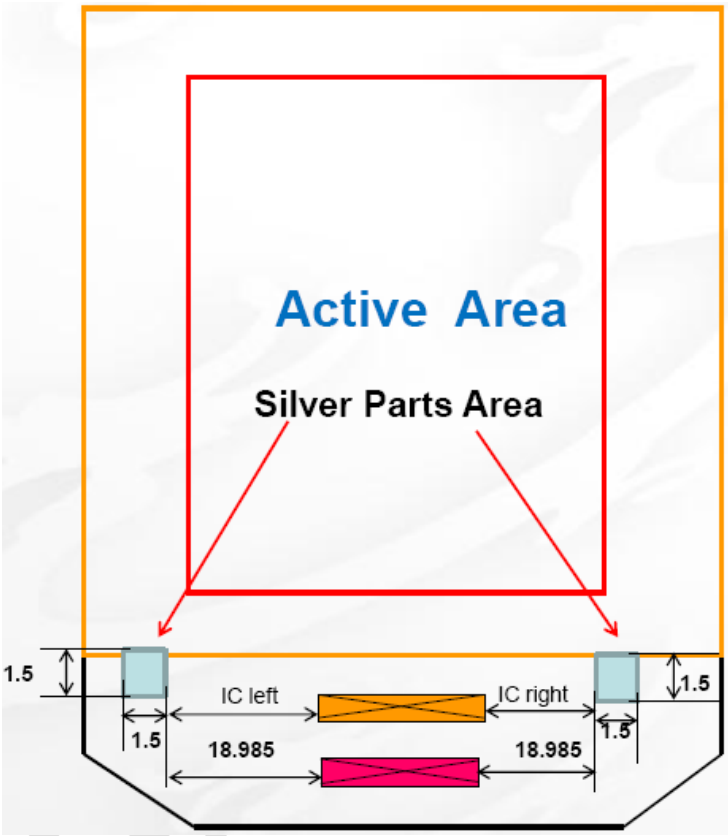
Figure 13 Outline Size of Cut Mark

6.4 Cell Thickness

Unit: mm

Figure 14 Cell Thickness

6.5 Silver Paste Position

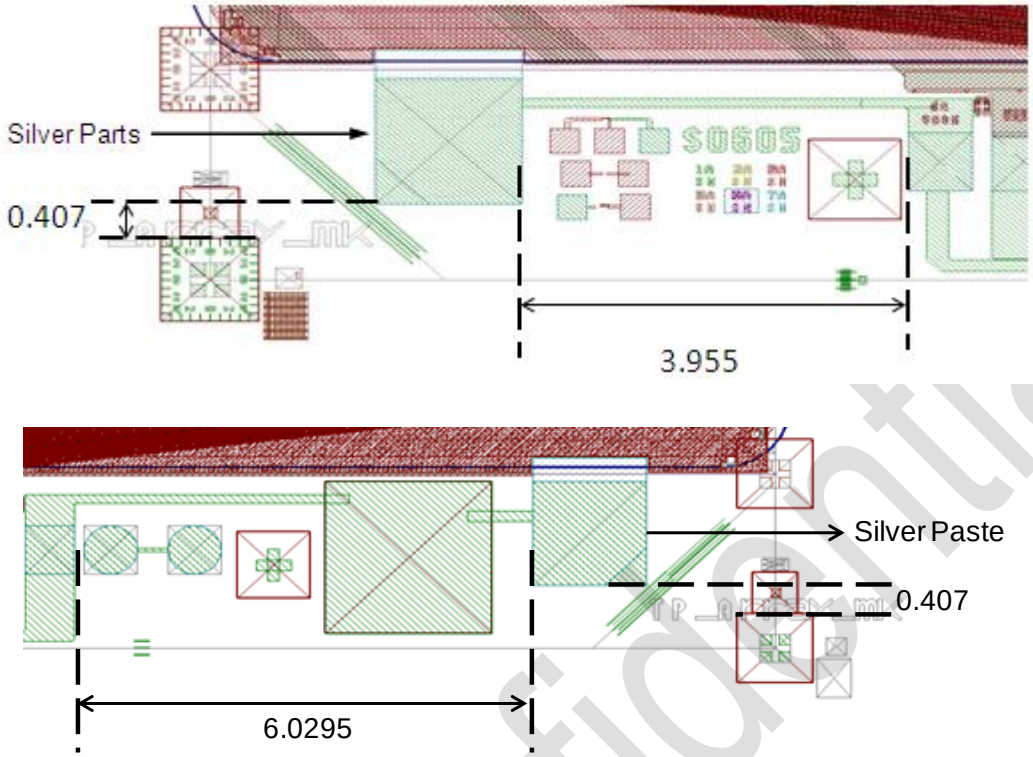


IC name	left	right
ILI9881C	17.91	17.91

Unit: mm

Figure 15 Silver Paste Position

6.6 Silver Paste on The Pad

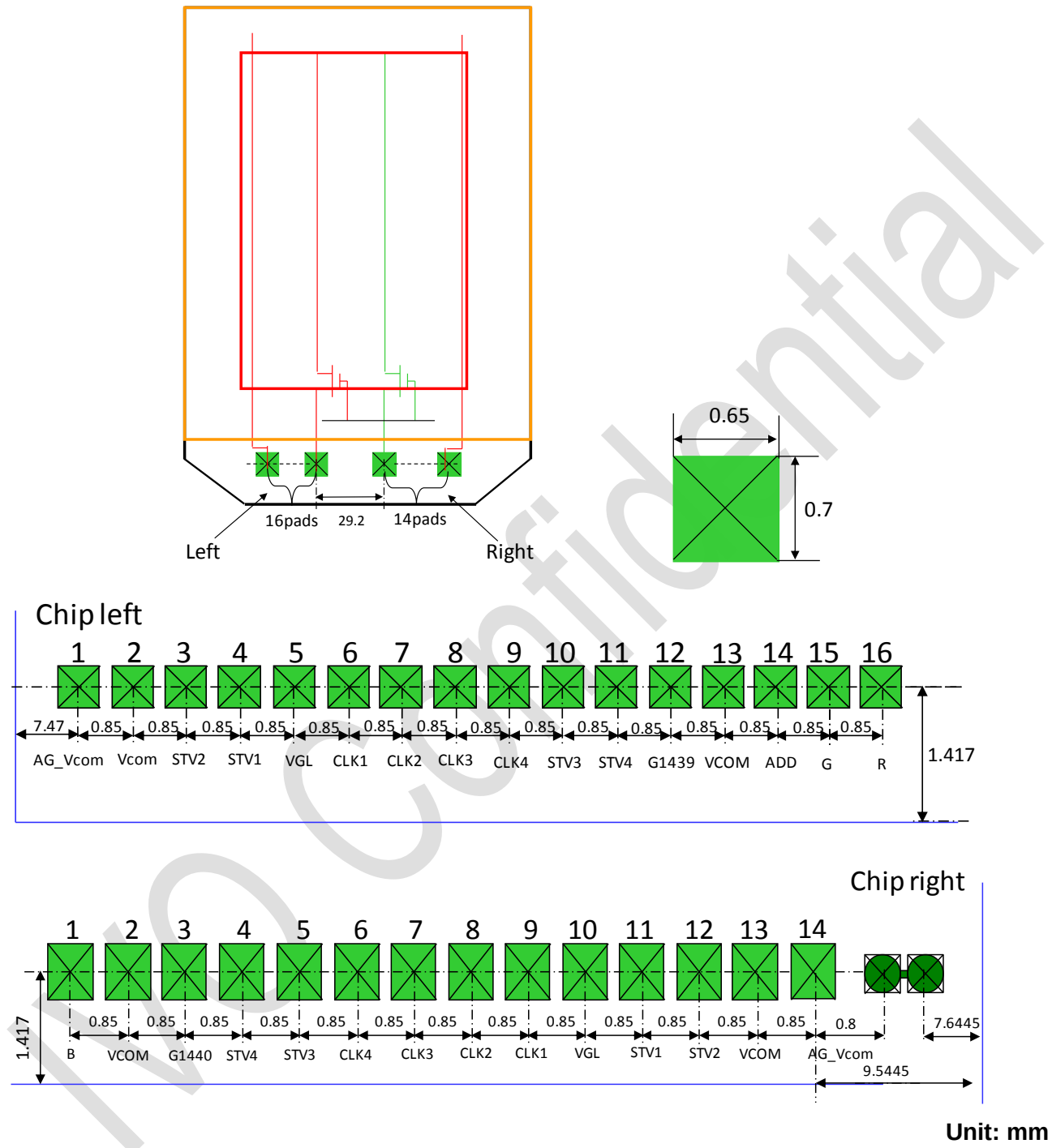


Unit: mm

Figure 16 Silver Paste on The Pad

7 Cell Light-On Information

7.1 Cell Light-On Test Pad Drawing



Unit: mm

Figure 17 Cell Light-On Test Pad Drawing

7.2 Cell Light-On Test Waveform

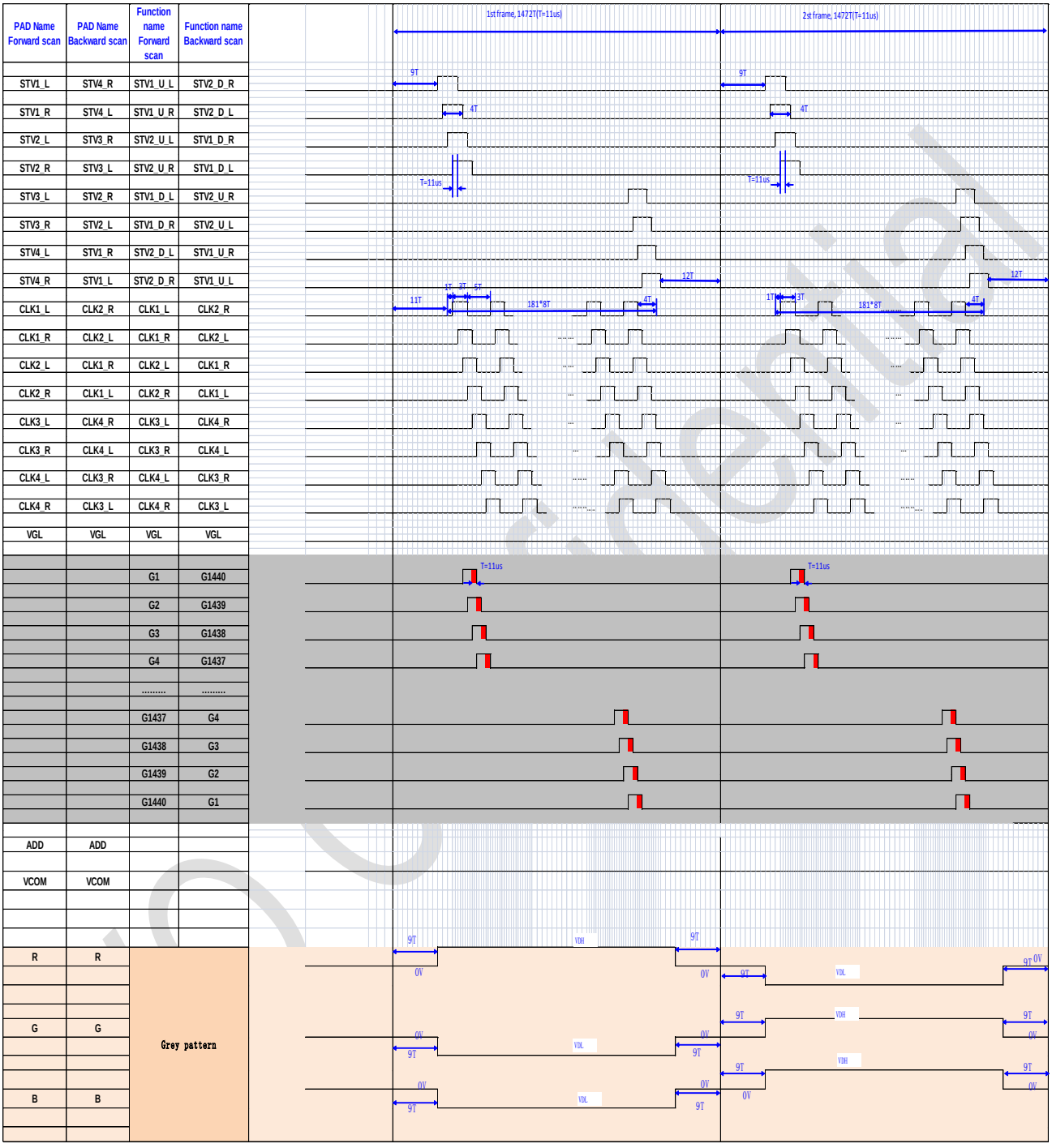


Figure 18 Cell Light-On Test Waveform

Table 6 Voltage for Cell Test

Item	Black	Gray	White

VGH	15V		
VGL	-11V		
VCOM	-0.77V		
ADD	17~25V		
R_VDH	0.2V	2.18V	4.8V
R_VDL	-0.2V	-2.18V	-4.8V
G_VDH	0.2V	2.18V	4.8V
G_VDL	-0.2V	-2.18V	-4.8V
B_VDL	0.2V	2.18V	4.8V
B_VDL	-0.2V	-2.18V	-4.8V

7.3 LCD FPC Input Pin Assignment

Table 7 LCD FPC Input Pin Assignment

NO.	Pin define	NO.	Pin define	NO.	Pin define	NO.	Pin define	NO.	Pin define	NO.	Pin define
1	DUMMY	34	C22N	67	VSSA	100	IM0	133	DUMMYP	166	LVDSVSS
2	DUMMY	35	C22N	68	VSS	101	VSS	134	DUMMYP	167	LVDSVSS
3	VCOM	36	C21P	69	DUMMYN	102	RESX	135	DUMMYP	168	LVDSVSS
4	DUMMYR1	37	C21P	70	VTESTOUTN	103	RESX	136	DUMMYP	169	DUMMY
5	VCOMR	38	C21P	71	VCIREF	104	TE1	137	DUMMYP	170	D3P
6	VGLO1	39	C21N	72	VCIREF	105	TE1	138	DUMMY	171	DUMMY
7	VGLO1	40	C21N	73	DUMMYN	106	TE1	139	DUMMY	172	D3N
8	VGLO2	41	VSN	74	MTP_PWR	107	TE	140	TOUT3	173	LVDSVSS
9	VGLO2	42	VSN	75	MTP_PWR	108	TE	141	VSS	174	D2P
10	C31P	43	VSP	76	EXTP	109	LEDPWM	142	VSS	175	DUMMY
11	C31P	44	VSP	77	EXTP	110	CSX	143	VSS	176	D2N
12	C31P	45	VSP	78	EXTP	111	DCX	144	VSS	177	DUMMY
13	VGL	46	C42N	79	EXTN	112	DCX	145	VSS	178	LVDSVSS
14	VGL	47	C42N	80	EXTN	113	PCLK	146	VCORE	179	CLKP
15	C24N	48	C42P	81	EXTN	114	VSSDUMMY	147	VCORE	180	CLKN
16	C24N	49	C42P	82	VSS	115	VS	148	VCORE	181	DUMMY
17	C24P	50	C42P	83	VSS	116	HS	149	VCORE	182	LVDSVSS
18	C24P	51	C41N	84	VSS	117	D0	150	VCORE	183	DUMMY
19	C24P	52	C41N	85	VDD-18	118	D2	151	VCORE	184	D1P
20	C23N	53	C41P	86	VDD-18	119	D4	152	VCC1	185	D1N
21	C23N	54	C41P	87	VCC	120	D5	153	VCC1	186	DUMMY
22	C23P	55	VCL	88	BOOSTM1	121	D6	154	VCC1	187	LVDSVSS
23	C23P	56	VCL	89	VSS	122	VSS	155	VCC1	188	D0P
24	C23P	57	VCI	90	BOOSTM0	123	DUMMYP	156	VCC1	189	D0N
25	VSS	58	VCI	91	VDDI	124	DUMMYP	157	VDDAM	190	DUMMY
26	VSS	59	VCI	92	LANSEL	125	DUMMYP	158	VDDAM	191	LVDSVSS
27	VCI	60	VSS	93	VSS	126	DUMMYP	159	VDDAM	192	VTESTOUTP
28	VCI	61	VSS	94	RS1	127	DUMMYP	160	VDDAM	193	VSSA
29	VGH	62	VREF	95	VDDI	128	DUMMYP	161	LVDSVDD	194	VSSA
30	VGH	63	VSNR	96	RS0	129	DUMMYP	162	LVDSVDD	195	VSSA
31	C22P	64	VSPR	97	VSS	130	DUMMYP	163	LVDSVDD	196	VCOM
32	C22P	65	VSSA	98	IM1	131	DUMMYP	164	LVDSVDD	197	ITO GND
33	C22P	66	VSSA	99	VDDI	132	DUMMYP	165	LVDSVSS	198	DUMMY

8 Reliability Condition

Table 8 Reliability Condition

NO	Item	Condition
1	High temperature Operation	T_{gs}=70℃,240hours
2	Low temperature Operation	T_a=-20℃,240hours
3	High temperature Storage	T_a=80℃,240hours
4	Low temperature Storage	T_a=-30℃,240hours
5	High temperature/High humidity Operation	T_{gs}=60℃, 90%RH,240hours

Note(1) A sample can only have one test. Outward appearance, image quality and optical data can only be checked at normal conditions according to the IVO document before reliable test. Only check the function of the panel after reliability test.

Note(2) The setting of electrical parameters should follow the initial code specified by IVO before reliability test. Besides, in OTP mode, Vcom must be adjusted to optimize display quality. It is recommended to use the backlight that specified by IVO.

Note(3) The sample must be released for 24 hours under normal conditions before judging. Furthermore, all the judgment must be made under normal conditions. Normal conditions are defined as follow: Temperature: 25℃, Humidity: 55± 10%RH. T_a= Ambient Temperature, T_{gs}= Glass Surface Temperature.

Note(4) During the test, it is unaccepted to have condensate water remains. Besides, protect the module from static electricity.

9 IVO Recommended Packaging

9.1 Sub Sheet Packaging

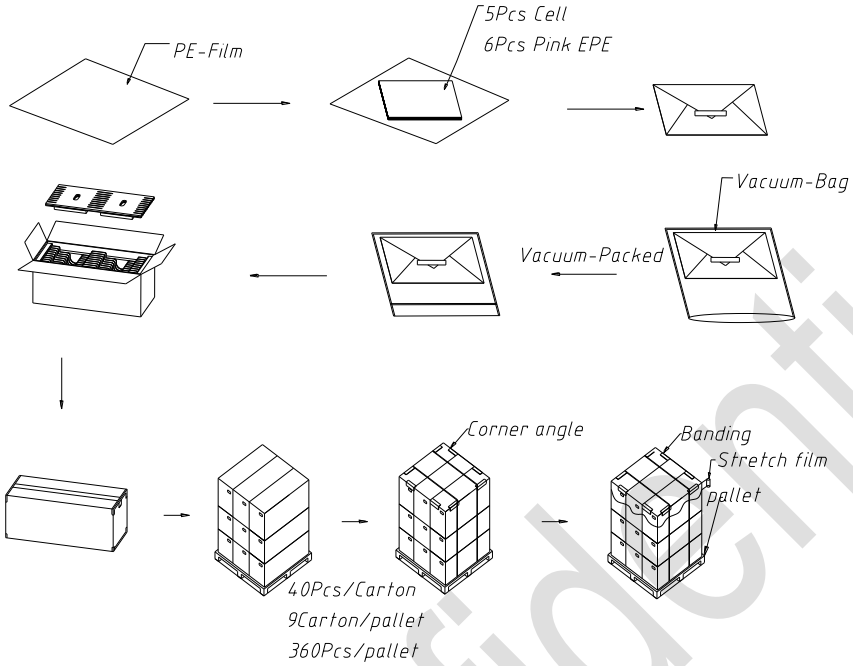


Figure 19 Sub A Packaging

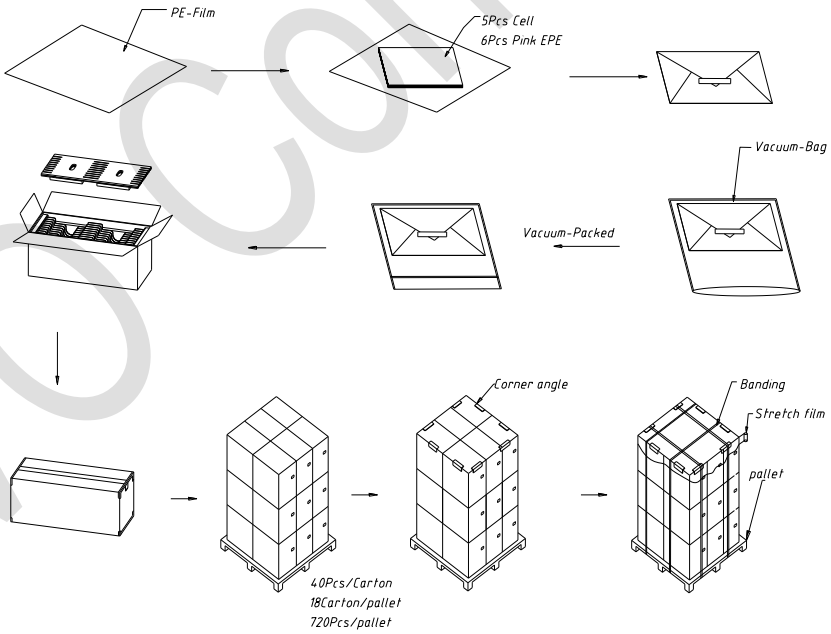


Figure 20 Sub B Packaging

10 General Precaution

10.1 Use Restriction

This product is not authorized for using in life supporting systems, aircraft navigation control systems, military systems and any other appliance where performance failure could be life-threatening or lead to be catastrophic.

10.2 Operation Precaution

(1) The LCD product should be operated under normal conditions.
Normal conditions are defined as below:
Temperature: 25℃
Humidity: 55±10%
Display pattern: continually changing pattern (Not stationary)
(2) Brightness and response time depend on the temperature. (It needs more time to reach normal brightness in low temperature.)
(3) Image sticking may occur when the module displayed the same pattern for long time.
(4) Do not connect or disconnect the panel in the “power on” condition. Power supply should always be turned on/off by the “power on/off sequence”

10.3 Handling Precaution

(1) All the operators should be electrically grounded through adequate methods such as an anti-static wrist band, and with ionized air blowing to the panel surface when handling.
(2) Dressing finger-stalls out of the gloves is important for keeping the panel clean during the incoming inspection and the process of assembly.
(3) Do not apply strong mechanical impact or static load to the panel, so as to avoid breaking it.
(4) Clean the panel gently with absorbent cotton or soft cloth when it is dirty.
(5) Wipe off saliva or water drops on the polarizer, as soon as possible. Otherwise, it may cause deformation and fading of color.
(6) Desirable cleaners are IPA (Isopropyl Alcohol) or hexane. Do not use Ketone type materials (ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
(7) When expose to drastic fluctuation of temperature (hot to cold or cold to hot), the LCD panel may be affected; It is necessary for you to pay attention to condensation when the ambient temperature drops suddenly. Condensate water would damage the polarizer and electrical contacted parts of the panel. Besides, smear or spot will remain after condensate water evaporating.
(8) The TFT-LCD Panel shall be installed flat, without twisting or bending
(9) If the liquid crystal material leaks from the panel, keep it away from the eyes and mouth. In case of contact with hands, legs or clothes, it must be clean with soap thoroughly.

10.4 Storage Precaution

When storing the product as spares for a long time, the following precautions are necessary.

(1) Store them in a dark place. Do not expose to sunlight or fluorescent light. Keep the temperature between 5℃ and 35℃ at normal humidity.
(2) The product's glass surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.
(3) It is recommended to use it in a short-time period, after it's unpacked. Otherwise, we would not guarantee the quality.

10.5 Reprocessing Precaution

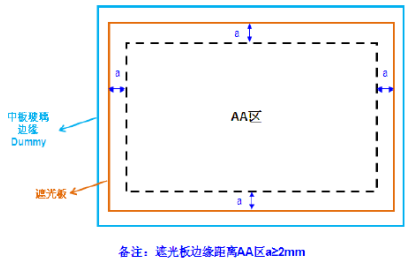
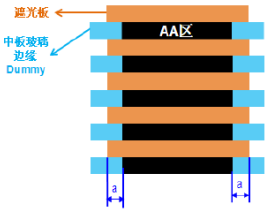
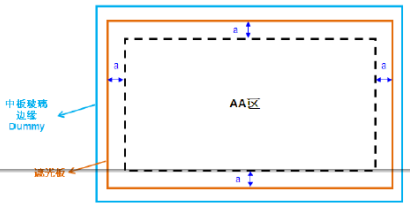
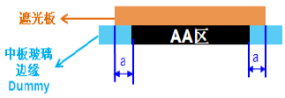
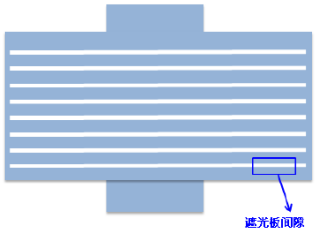
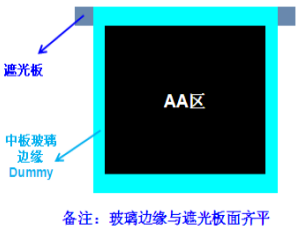
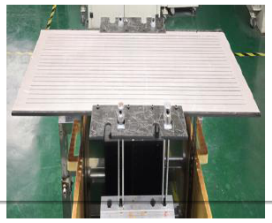
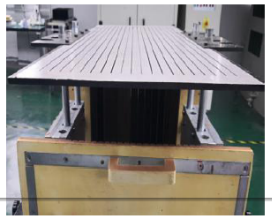
In order to ensure original product status, protective measures must be assessed before any reprocessing, including UV, ESD and high temperature prevention, etc.. Product storage and usage condition also must be considered. For glass slimming process, we insist to strictly observe IVO standard operation procedure《Slimming Process Instruction》.

10.6 Disposal

When disposing LCD panel, obey the local environmental regulations.

昆山龙腾光电有限公司
InfoVision Optoelectronics (Kunshan) Co., LTD.

薄化制程生产标准说明表
Slimming Process Instruction

	UV固化方式		遮光板设计	作业标准
UV固化制程	水平固化	箱式固化	 备注：遮光板边缘距离AA区a≥2mm  备注：遮光板边缘距离AA区a≥2mm	1、将中板玻璃进行叠片，叠放层数≤5层 2、遮光板变形不可有，遮光板需紧贴玻璃表面，玻璃有效区需完全遮盖，遮光板边缘距离AA区a≥2mm 3、中板玻璃边缘进行UV封胶，渗胶量≥1mm 4、将产品缓慢推进固化炉固化 5、固化期间玻璃表面温度＜70℃
		传动固化	 备注：遮光板边缘距离AA区a≥2mm  备注：遮光板边缘距离AA区a≥2mm	1、将中板玻璃进行叠片，叠放层数1层 2、遮光板变形不可有，遮光板需紧贴玻璃表面，玻璃有效区需完全遮盖，遮光板边缘距离AA区a≥2mm 3、中板玻璃边缘进行UV封胶，渗胶量≥1mm 4、将产品平稳放入传送带 5、固化期间玻璃表面温度＜70℃
	垂直固化		 备注：遮光板间隙大小设计1.5 ±0.2mm  备注：玻璃边缘与遮光板面齐平  	1、将中板玻璃垂直插入封胶架 2、中板玻璃边缘进行UV封胶，渗胶量≥1mm 3、遮光板变形不可有，将中板玻璃均匀卡入遮光板间隙中(遮光板间隙大小设计1.5 ± 0.2mm)，玻璃边缘与遮光板面齐平 4、中板玻璃有效区需完全遮盖，不可漏光 5、将产品缓慢推进固化炉固化 6、固化期间玻璃表面温度＜70℃

	尺寸	研磨实测压力管控	研磨时间管控
研磨	≤7"	≤60g/cm^2	≤6min/面
	＞7"	≤50g/cm^2	≤3min/面