



Document Title	C050SWAK-3 Customer Approval Specification		Page No.	1/23	
Document No.		Issue date	2018/12/13	Revision	00

Customer Approval Specification

To: Customer

Product Name: C050SWAK-3

Document Issue Date: 2018/12/13

Customer
<u>SIGNATURE</u>

InfoVision Optoelectronics
<u>SIGNATURE</u>
REVIEWED BY
QA

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.

FQ-7-30-0-009-03D

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	3/23
Document No.		Issue date	2018/12/13	Revision	00

CONTENTS

1	GENERAL DESCRIPTIONS.....	4
2	ABSOLUTE MAXIMUM RATINGS.....	5
3	ELECTRICAL SPECIFICATIONS.....	6
4	OPTICAL CHARACTERISTICS.....	7
5	PIXEL FORMAT.....	11
6	OUTLINE SIZE.....	12
7	CELL LIGHT-ON INFORMATION.....	16
8	RELIABILITY CONDITION.....	19
9	IVO RECOMMENDED CELL PACKAGING.....	20
10	GENERAL PRECAUTION.....	22

IVO Confidential

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	4/23
Document No.		Issue date	2018/12/13	Revision	00

1 General Descriptions

1.1 Introduction

The C050SWAK-3 R0 is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) single chip and sub sheet that use amorphous silicon TFT as a switching device. This TFT LCD panel has a 4.99 inch diagonally measured active display area with HD resolution (720 horizontal by 1280 vertical pixels array).

1.2 Features

- 4.99 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)	64.50 x 117.69x 0.80		mm	Single Chip
Active Area (H x V)	62.1 x110.4		mm	Single Chip
Number of Pixels (H x V)	720(RGB) x 1280		-	Single Chip
Pixel Size (H x V)	0.08625 x 0.08625		mm	Single Chip
Display Type	Transmissive		-	-
Display Mode	Normally Black		-	-
Cell Thickness	CF: 0.40±0.04		mm	Single Chip
	TFT: 0.40±0.04		mm	
Driver IC(Recommendation)	HX8394-F		-	-
Weight	15.076(Typ.)	16.584(Max.)	g	Single Chip
	452.296(Typ.)	248.763(Max.)	g	Sub A
	407.068(Typ.)	223.887(Max.)	g	Sub B

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	5/23
Document No.		Issue date	2018/12/13	Revision	00

2 Absolute Maximum Ratings

Table 2 Absolute Ratings of Environment

Item	Symbol	Min.	Max.	Unit	Conditions
LC Operating Voltage ($T_a = 25^\circ\text{C}$)	V_{op}	-4.8	4.8	V	(1),(2),(3),(4)
Operating Temperature	T_{gs}	-20	70	$^\circ\text{C}$	
Operating Humidity	H_{op}	10	90	%RH	
Storage Temperature	T_a	-30	80	$^\circ\text{C}$	
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°C , Humidity: $55 \pm 10\%RH$.
- 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 58°C , and no condensation of water. Besides, protect the module from static electricity.

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	6/23
Document No.		Issue date	2018/12/13	Revision	00

3 ELECTRICAL SPECIFICATIONS

Table3 Electrical Specifications

No.	Item	Min.	Typ.	Max.	Unit
1	Vcom voltage	-1.97	-0.97	-0.03	V
2	Frame Rate	55	60	65	Hz
3	VGH voltage	14.0	15.0	16.0	V
4	VGL voltage	-12.0	-11.0	-10.0	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.

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	7/23
Document No.		Issue date	2018/12/13	Revision	00

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	4.1	-	%	Under C-light (1),(5),(7),(8),(10) $\theta_x=\theta_y=0^\circ$
Contrast Ratio	Center		900	1200	-	-	(1),(3),(6),(7),(8) $\theta_x=\theta_y=0^\circ$
Response Time	Rising + Falling		-	35	40	ms	(1),(4),(6),(7),(8) $\theta_x=\theta_y=0^\circ$
CF Color Chromaticity (CIE1931)	Red	x	Typ. -0.03	0.660	Typ. +0.03	-	Under C-light (1),(5),(8) $\theta_x=\theta_y=0^\circ$
	Red	y		0.320		-	
	Green	x		0.280		-	
	Green	y		0.573		-	
	Blue	x		0.140		-	
	Blue	y		0.075		-	
	White	x		0.309		-	
	White	y		0.333		-	
NTSC	CIE1931		65	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	-		

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	8/23
Document No.		Issue date	2018/12/13	Revision	00

Note (1) Measurement Setup:

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

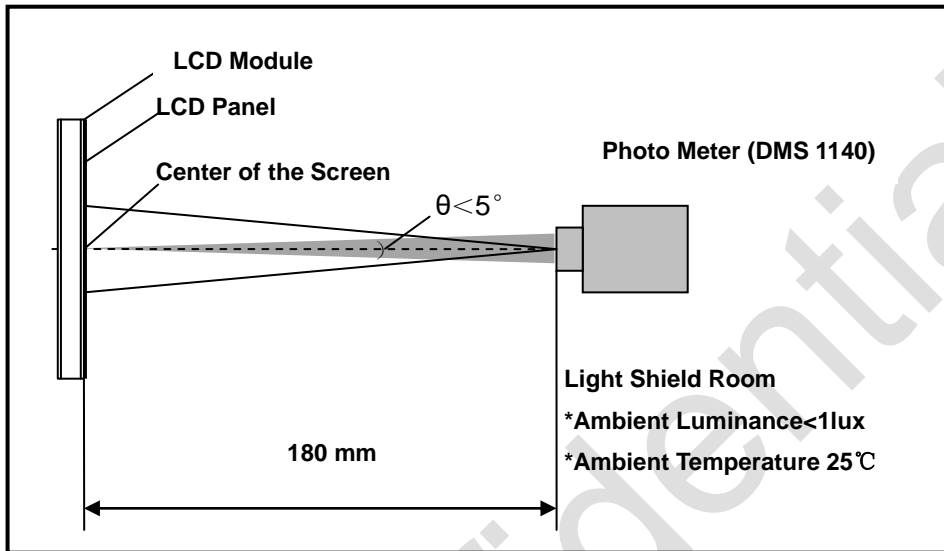


Figure 1 Measurement Setup

Note (2) Definition of Viewing Angle

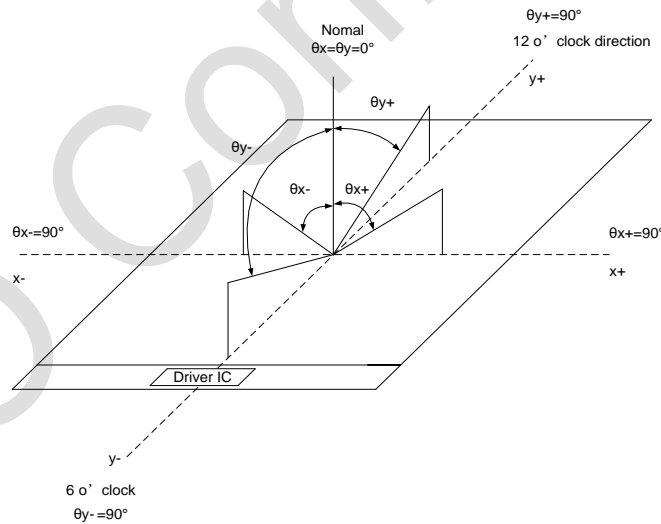


Figure 2 Definition of Viewing Angle

Note (3) Definition Of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression

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

L255: Luminance of gray level 255, L0: Luminance of gray level 0

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	9/23
Document No.		Issue date	2018/12/13	Revision	00

Note (4) Definition Of Response Time

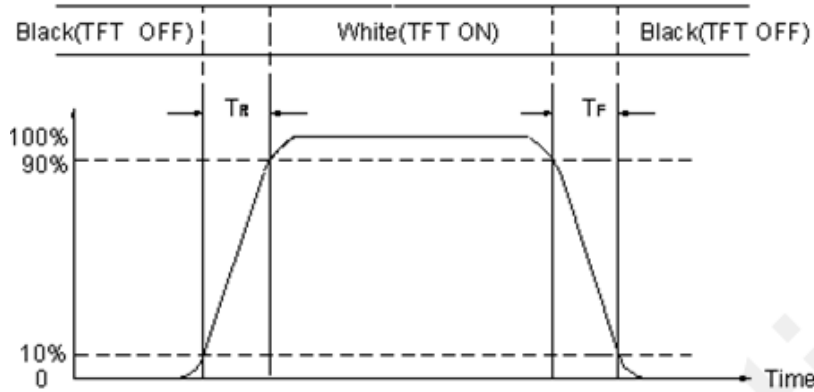


Figure 3 Definition of Response Time

Note (5) C-Light Spectrum Based on VESA-1931

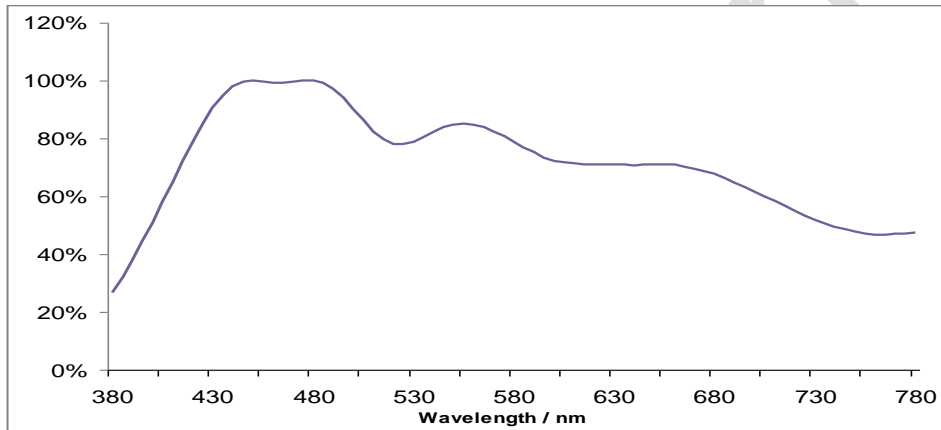


Figure 4 C-Light Spectrum

Note (6) BL Spectrum which is given by IVO

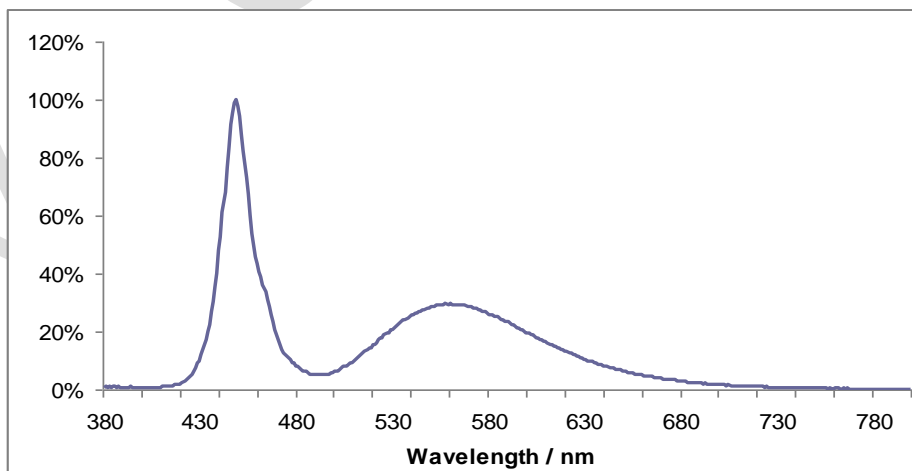


Figure 5 BL Spectrum

Note (7) The polarizer type: Sunnypol / 5115AS-10-T / CF, Sunnypol / 5115AG6-10-TD / Array.

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	10/23
Document No.		Issue date	2018/12/13	Revision	00

Note (8) All optical data based on IVO given polarizer & Light source & testing machine in this document.

Note (9) Polarizer Direction (Recommend that customers choose O Mode or E Mode according to the actual situation)

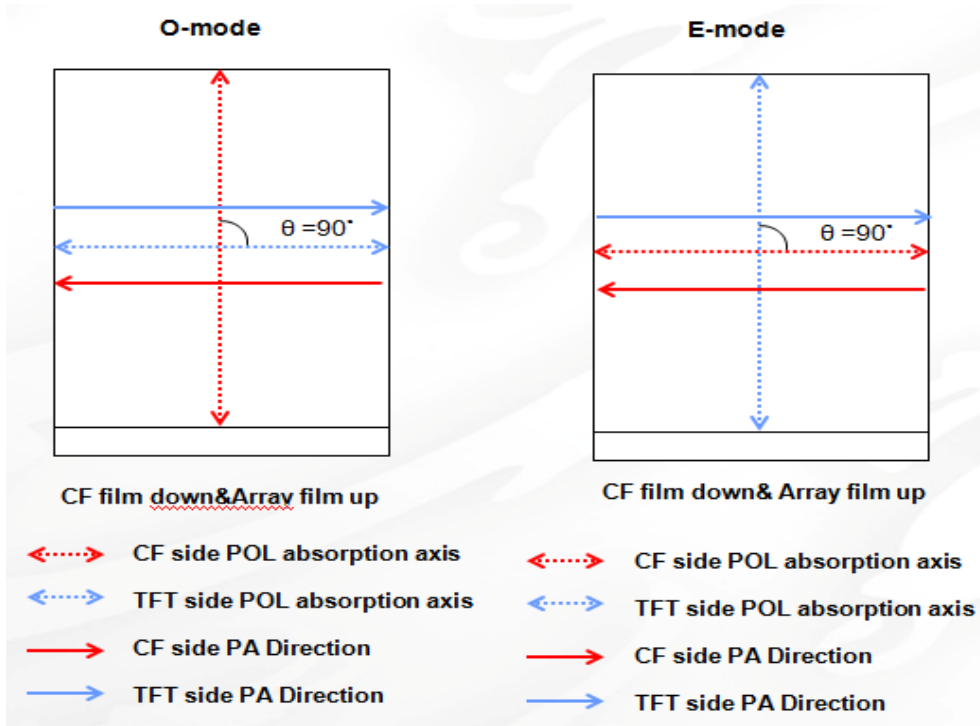


Figure 6 Polarizer Direction

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.

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	11/23
Document No.		Issue date	2018/12/13	Revision	00

5 Pixel Format

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

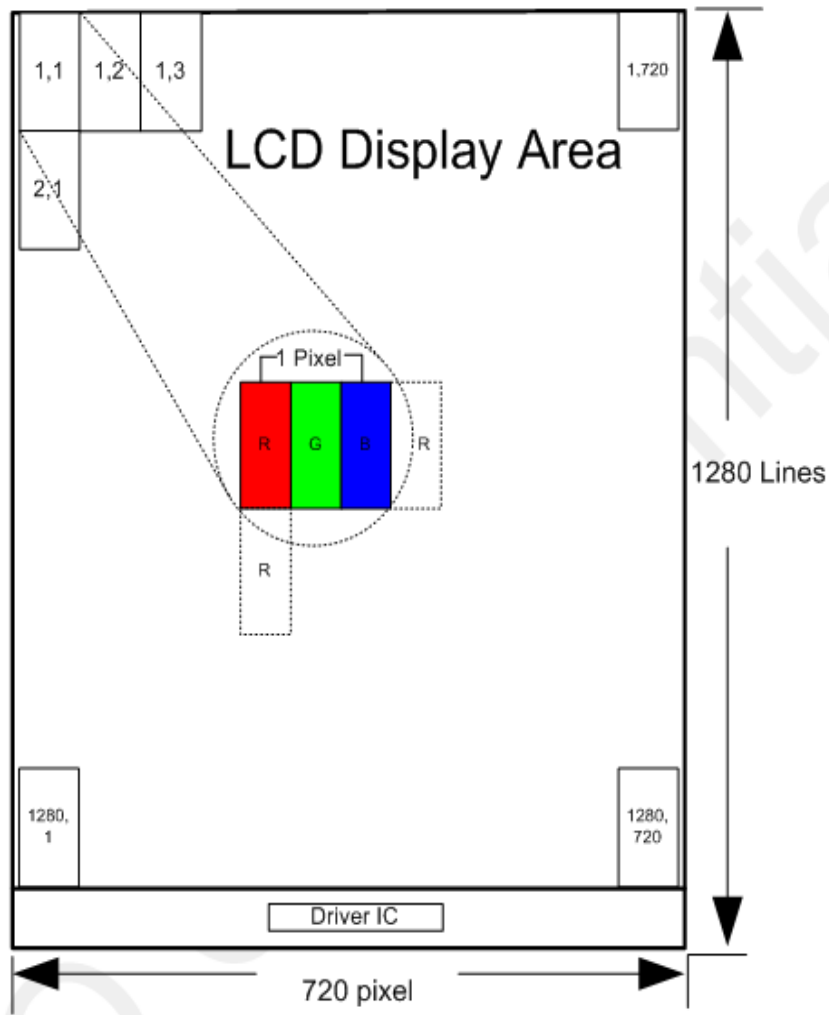
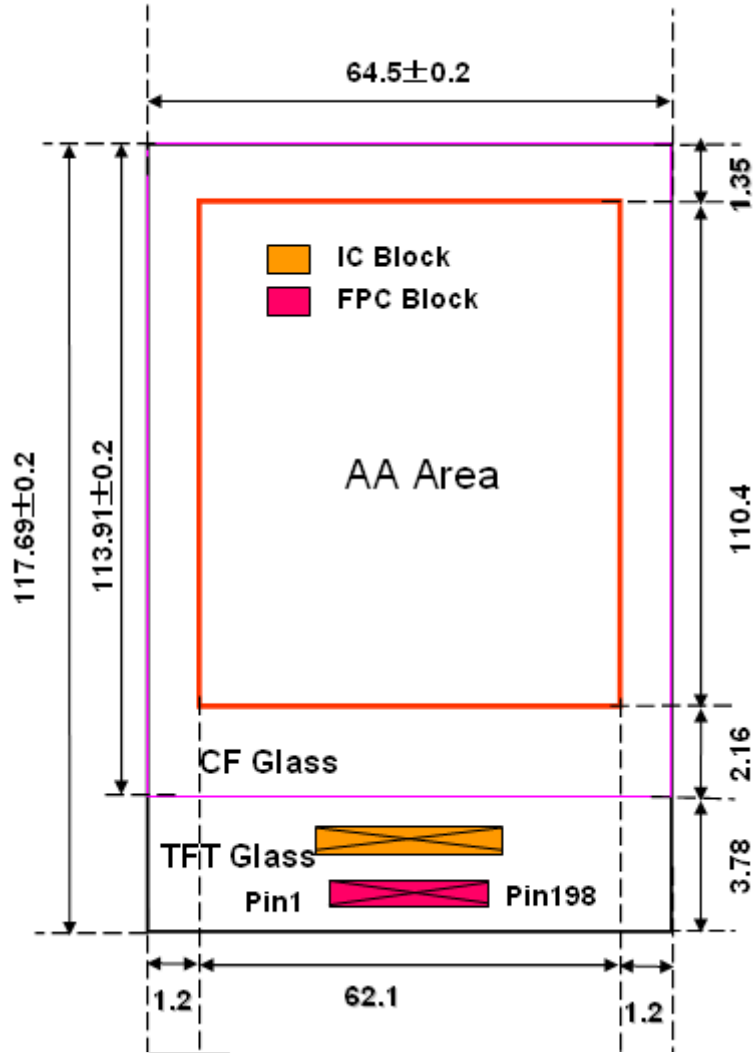


Figure7 Pixel Format

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	12/23
Document No.		Issue date	2018/12/13	Revision	00

6 Outline Size

6.1 Outline Size of Single Chip



Unit: mm

Figure 8 Outline Size of Single Chip

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	13/23
Document No.		Issue date	2018/12/13	Revision	00

6.2 IC/FPC Position On Cell

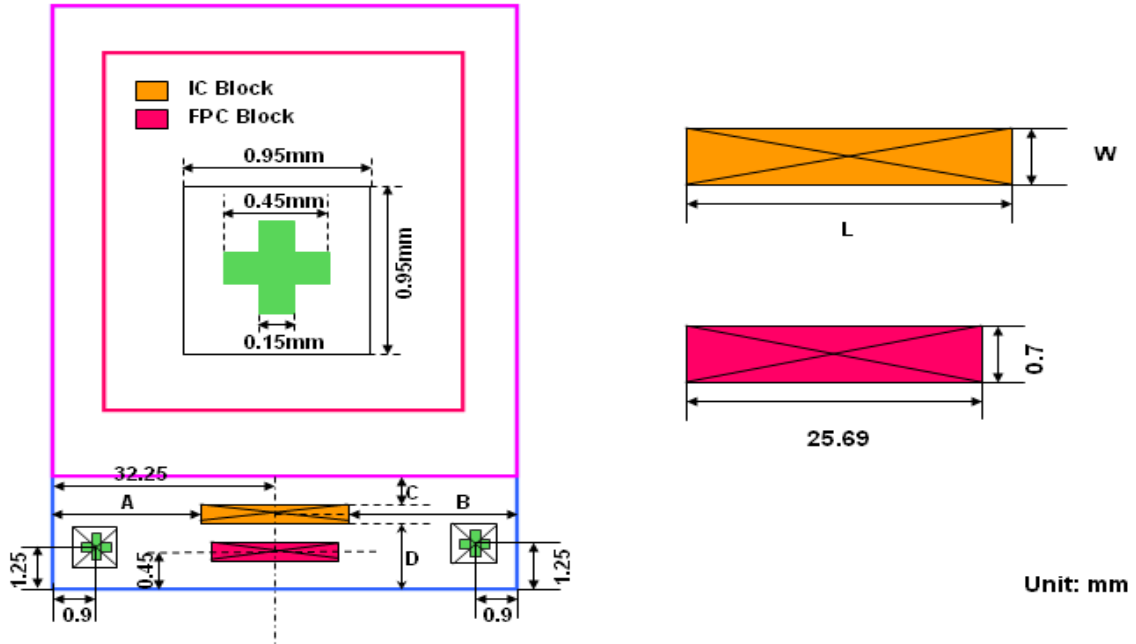


Figure 9 IC/FPC Position

Table 4 IC Position

IC name	length (um)	Width (um)	A(um)	B(um)	C(um)	D(um)
HX8394-F	27800	840	18350	18350	1052	1888

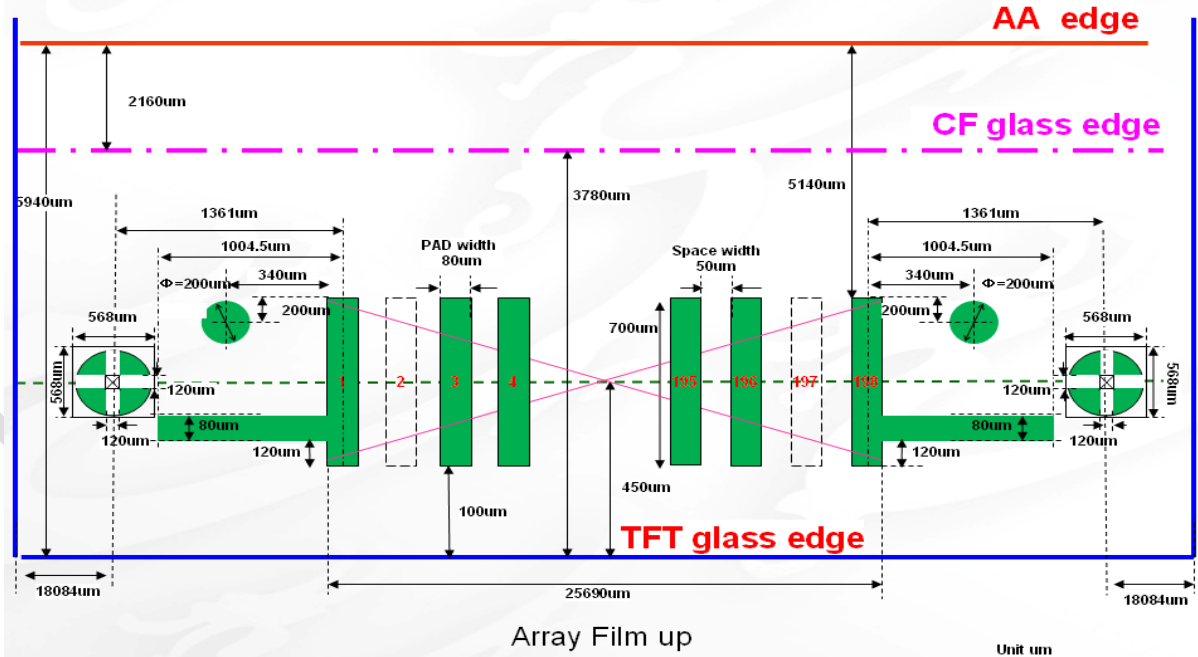
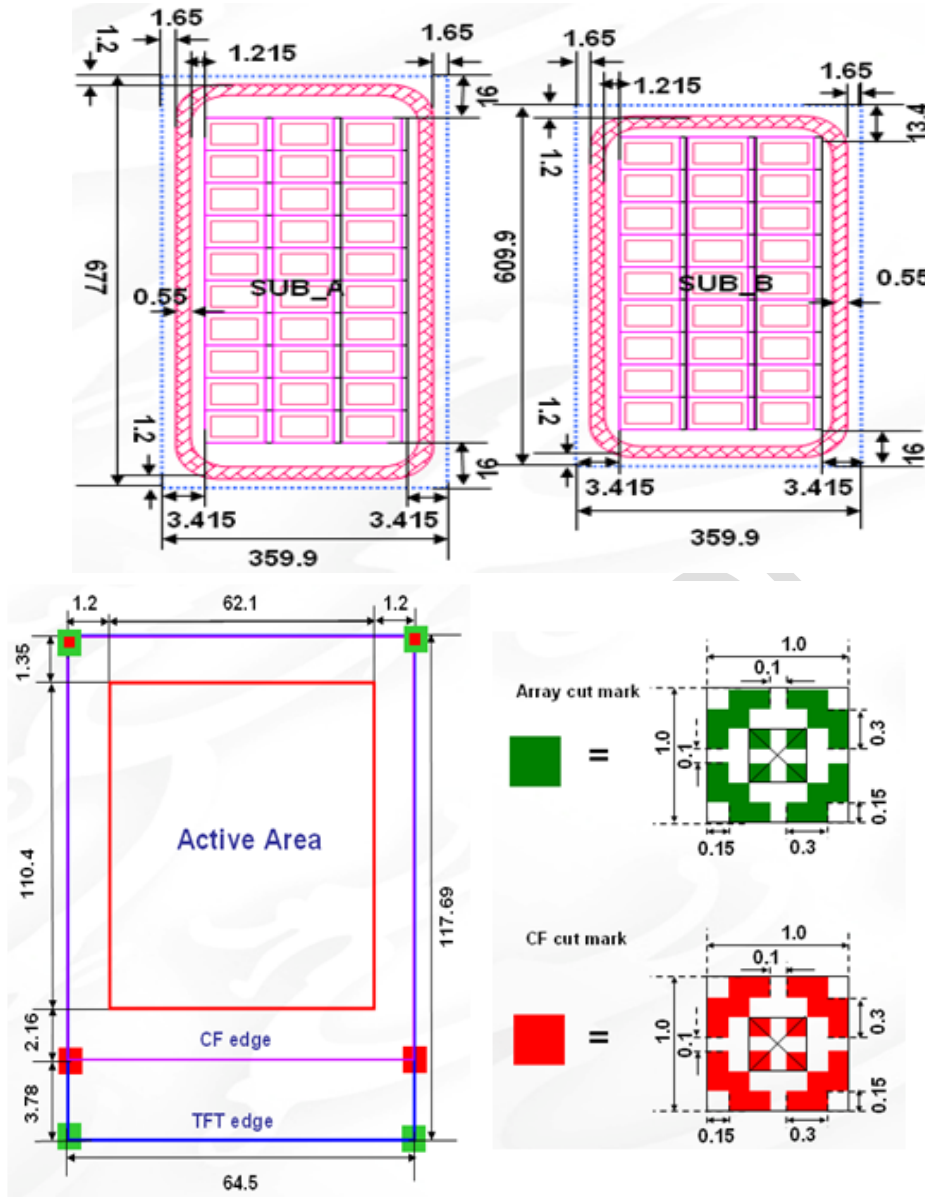


Figure 10 IC / FPC Position

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	14/23
Document No.		Issue date	2018/12/13	Revision	00

6.3 Outline Size of Sub Sheet and Cut Mark



Unit: mm

Figure 11 Outline Size of Sub Sheet and Cut Mark

6.4 Cell Thickness

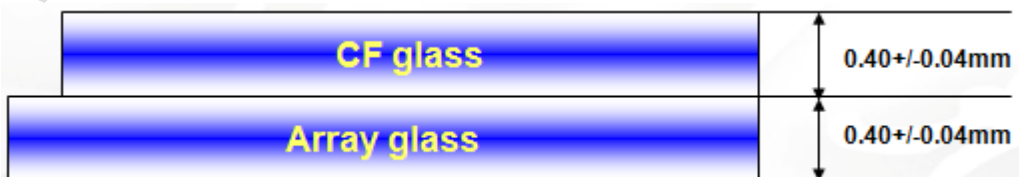


Figure 12 Cell Thickness

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	15/23
Document No.		Issue date	2018/12/13	Revision	00

6.5 Silver Paste Position

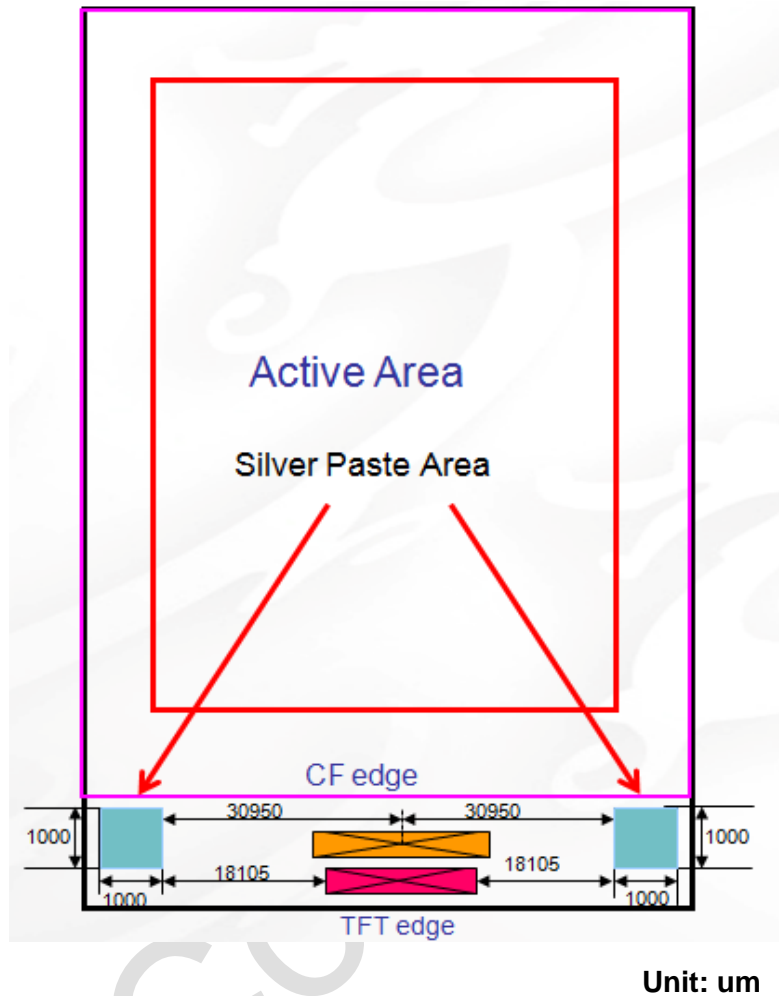
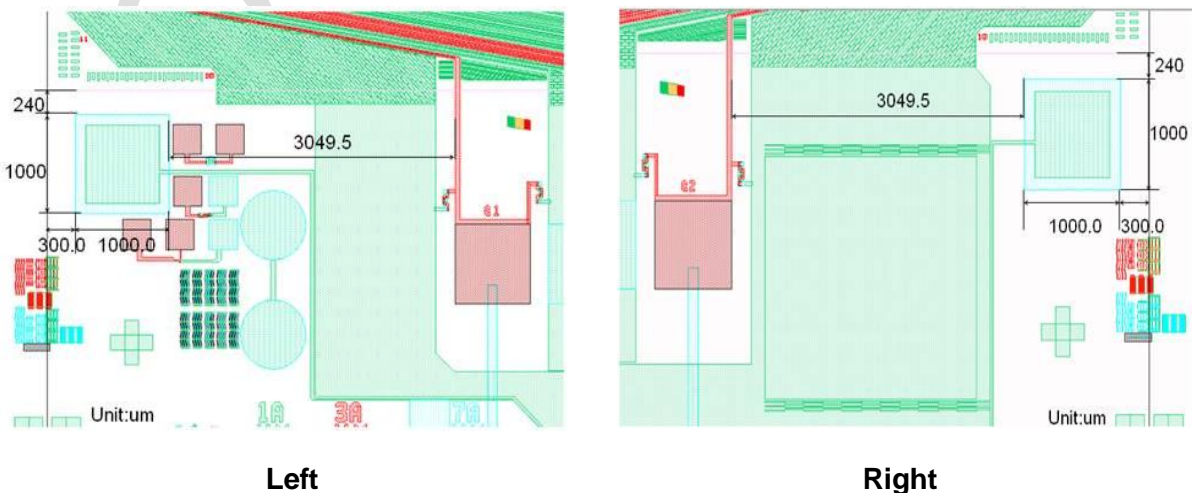


Figure 13 The Distance Between silver paste and Bonding area

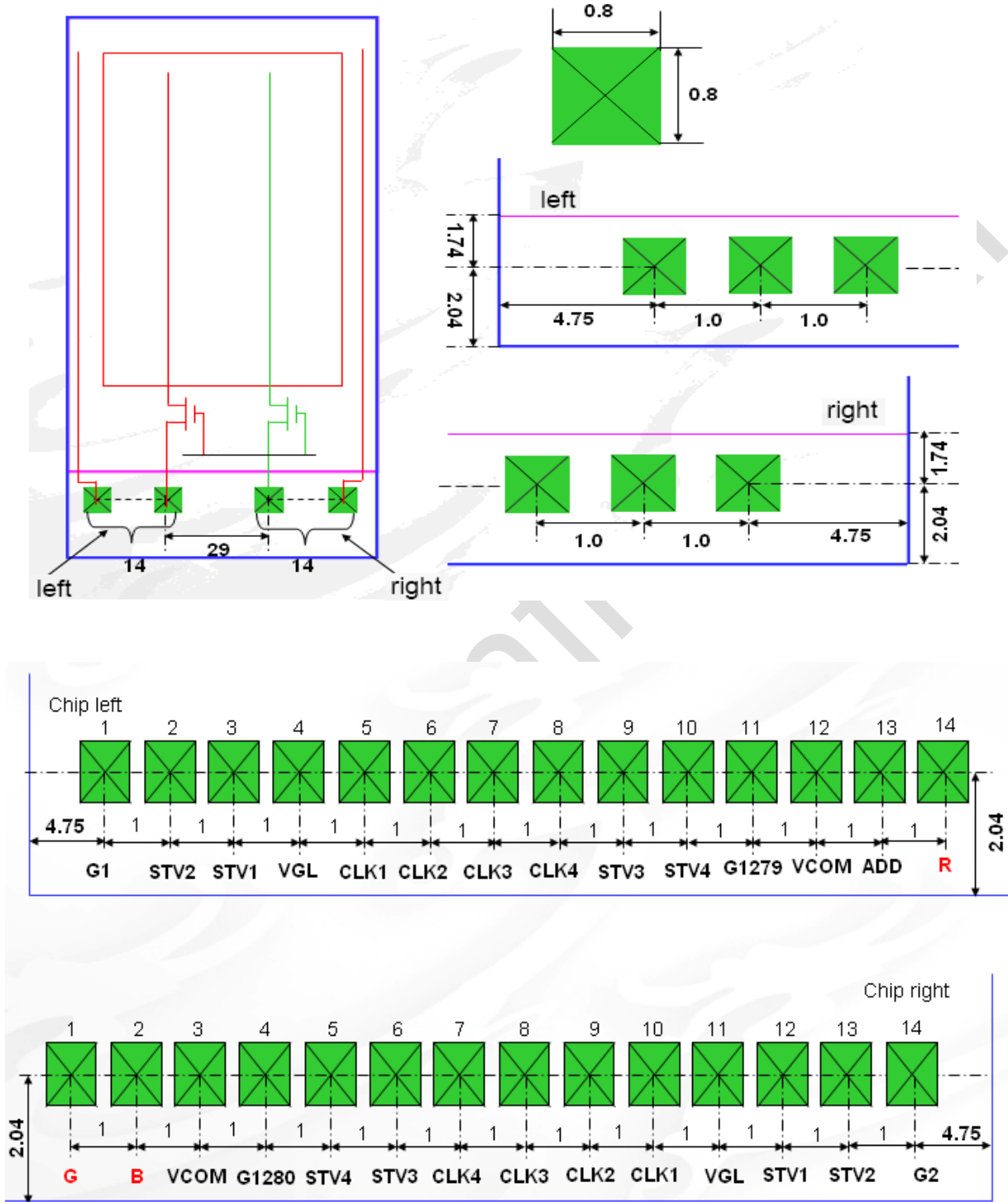
6.6 Silver Paste on The Pad



Document Title	C050SWAK-3 Customer Approval Specification			Page No.	16/23
Document No.		Issue date	2018/12/13	Revision	00

7 Cell Light-On Information

7.1 Cell Light-On Test Pad Drawing



Unit: mm

Figure 14 Cell Light-On Test Pad Drawing

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	17/23
Document No.		Issue date	2018/12/13	Revision	00

7.2 Cell Light-On Test Waveform

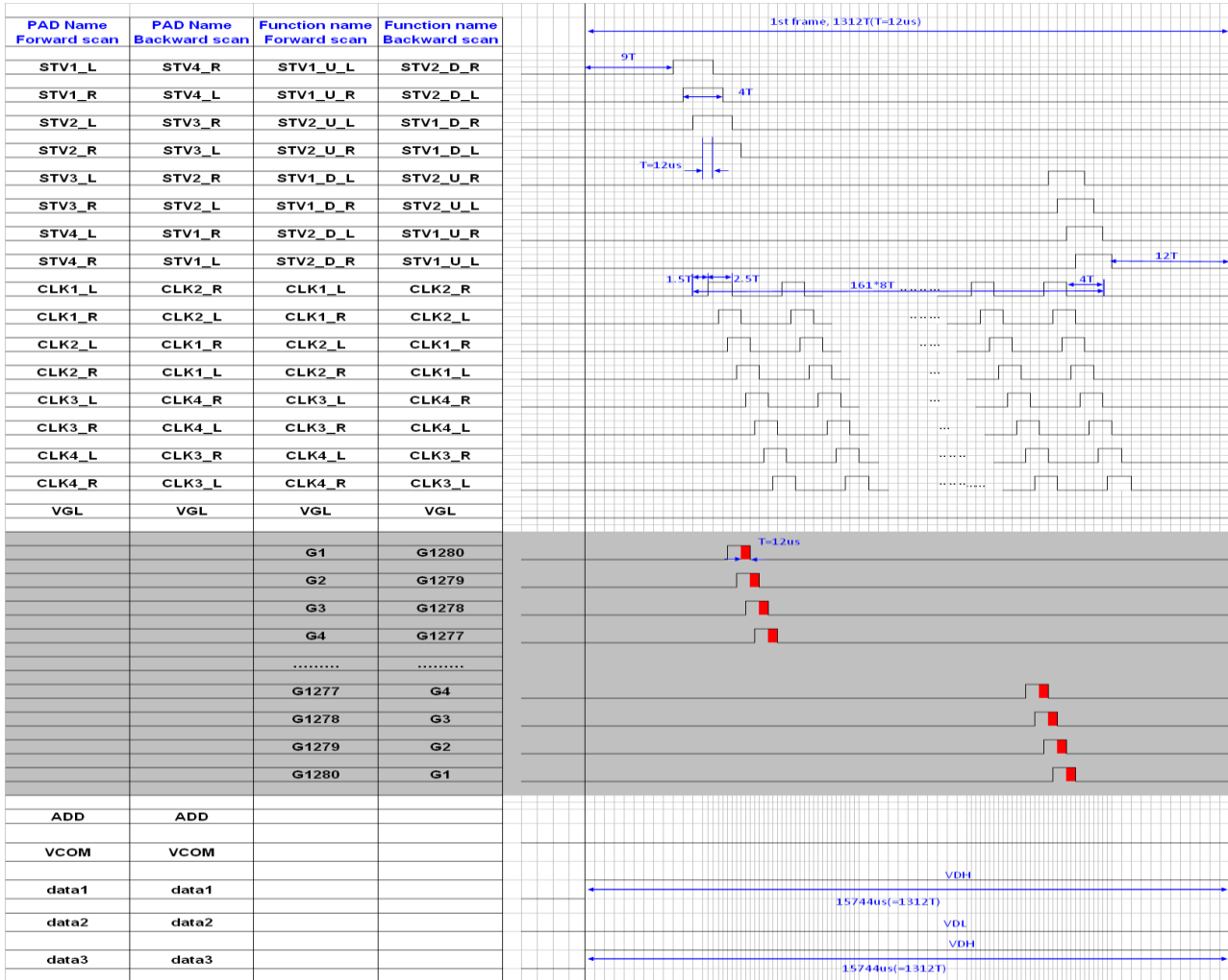


Figure 15 Cell Light-On Test Waveform

NOTES: For Cell Test, Need to check GIA forward and backward scan function

Table 5 Vdata Voltage

Item	Black	Gray	White
VGH		15V	
VGL		-11V	
Vcom		-0.97V	
ADD		17~25V	
SR VDH	0.2	2.4	4.8
SR VDL	-0.2	-2.4	-4.8
SG VDH	0.2	2.4	4.8
SG VDL	-0.2	-2.4	-4.8
SB VDH	0.2	2.4	4.8
SB VDL	-0.2	-2.4	-4.8

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	18/23
Document No.		Issue date	2018/12/13	Revision	00

7.3 FPC Input Pin Assignment

IC : HX8394F

Pin No.	Pin Define	Pin No.	Pin Define	Pin No.	Pin Define	Pin No.	Pin Define
1	DUMMY	51	C41N	101	VSS	151	VDD_18V
2	DUMMY	52	C41N	102	RESX	152	VCC
3	VCOM	53	C41P	103	RESX	153	VCC
4	DUMMYR1	54	C41P	104	TE1	154	VCC
5	VCOMR	55	VCL	105	TE1	155	VCC
6	VGLO1	56	VCL	106	TE1	156	VCC
7	VGLO1	57	VCI	107	TE	157	VDDAM
8	VGLO2	58	VCI	108	TE	158	VDDAM
9	VGLO2	59	VCI	109	LEDPWM	159	VDDAM
10	C31P	60	VSS	110	CSX	160	VDDAM
11	C31P	61	VSS	111	DCX	161	LVDSVDD
12	C31P	62	VREF	112	DCX	162	LVDSVDD
13	VGL	63	NGVDD	113	PCLK	163	LVDSVDD
14	VGL	64	GVDD	114	GOUT_SEL	164	LVDSVDD
15	C24N	65	VSSA	115	VS	165	LVDSVSS
16	C24N	66	VSSA	116	HS	166	LVDSVSS
17	C24P	67	VSSA	117	VSS	167	LVDSVSS
18	C24P	68	VSSA	118	VSS	168	LVDSVSS
19	C24P	69	DUMMYN	119	VSS	169	DUMMY
20	C23N	70	DUMMYN	120	VSS	170	HSSI_D3_P
21	C23N	71	VCI	121	VSS	171	DUMMY
22	C23P	72	VCI	122	VSS	172	HSSI_D3_N
23	C23P	73	VCI	123	NVDDA	173	LVDSVSS
24	C23P	74	MTP_PWR	124	C52N	174	HSSI_D2_P
25	VSS	75	MTP_PWR	125	C52N	175	DUMMY
26	VSS	76	EXTP	126	C52P	176	HSSI_D2_N
27	VCI	77	EXTP	127	C52P	177	DUMMY
28	VCI	78	EXTP	128	VSS	178	LVDSVSS
29	VGH	79	EXTN	129	C51N	179	HSSI_CLK_P
30	VGH	80	EXTN	130	C51N	180	HSSI_CLK_N
31	C22P	81	EXTN	131	C51N	181	DUMMY
32	C22P	82	VSS	132	C51P	182	LVDSVSS
33	C22P	83	VSS	133	C51P	183	DUMMY
34	C22N	84	VSS	134	VSS	184	HSSI_D1_P
35	C22N	85	VDD_18V	135	VSS	185	HSSI_D1_N
36	C21P	86	VDD_18V	136	VDDA	186	DUMMY
37	C21P	87	VCC	137	VDDA	187	LVDSVSS
38	C21P	88	BOOSTM1	138	DUMMY	188	HSSI_D0_P
39	C21N	89	VSS	139	DUMMY	189	HSSI_D0_N
40	C21N	90	BOOSTM0	140	DUMMY	190	DUMMY
41	VSN	91	VDDI	141	VSS	191	LVDSVSS
42	VSN	92	LANSEL	142	VSS	192	VSSA
43	VSP	93	VSS	143	VSS	193	VSSA
44	VSP	94	RS1	144	VSS	194	VSSA
45	CSP	95	VDDI	145	VSS	195	VSSA
46	C42N	96	RS0	146	VDD_18V	196	VCOM
47	C42N	97	VSS	147	VDD_18V	197	ITO_GND
48	C42P	98	IM1	148	VDD_18V	198	DUMMY
49	C42P	99	VDDI	149	VDD_18V		
50	C42P	100	IM0	150	VDD_18V		

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	19/23
Document No.		Issue date	2018/12/13	Revision	00

8 Reliability Condition

Table 6 Reliability condition

NO	Item	Condition
1	High Temperature Operating Test	$T_{gs}=70^{\circ}\text{C}$, 240 hours
2	Low Temperature Operating Test	$T_a=-20^{\circ}\text{C}$, 240 hours
3	High Temperature Storage Test	$T_a=80^{\circ}\text{C}$, 240 hours
4	Low Temperature Storage Test	$T_a=-30^{\circ}\text{C}$, 240 hours
5	High Temperature/High Humidity Operating Test	$T_{gs}=60^{\circ}\text{C}$, 90%RH, 240 hours

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. The backlight should be 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°C , Humidity: $55\pm 10\%\text{RH}$. T_a = Ambient Temperature, T_{gs} = Glass Surface Temperature.

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	20/23
Document No.		Issue date	2018/12/13	Revision	00

9 IVO Recommended Cell Packaging

9.1 Single chip

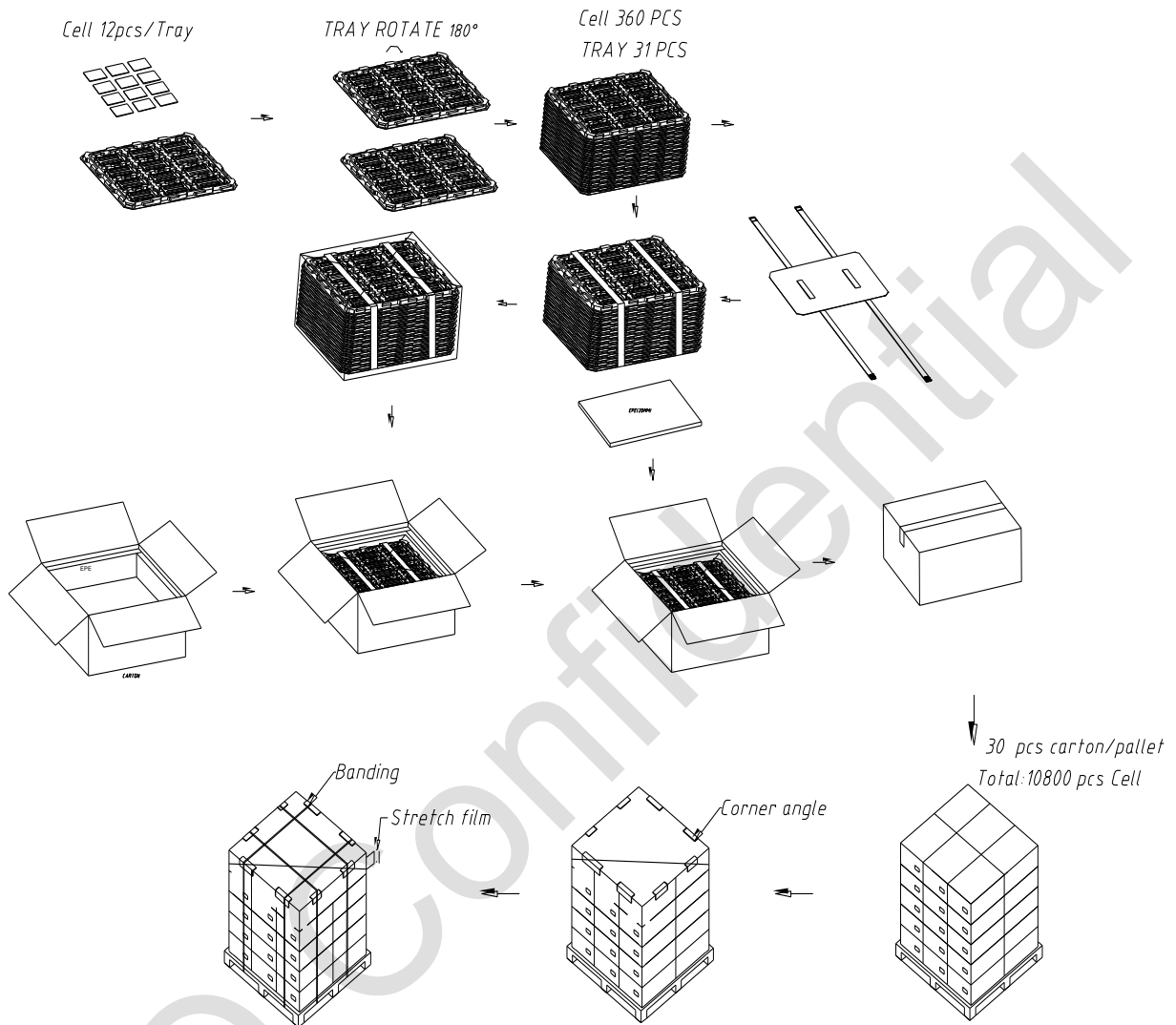


Figure 17 Single Chip Packaging

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	21/23
Document No.		Issue date	2018/12/13	Revision	00

9.2 Sub Sheet

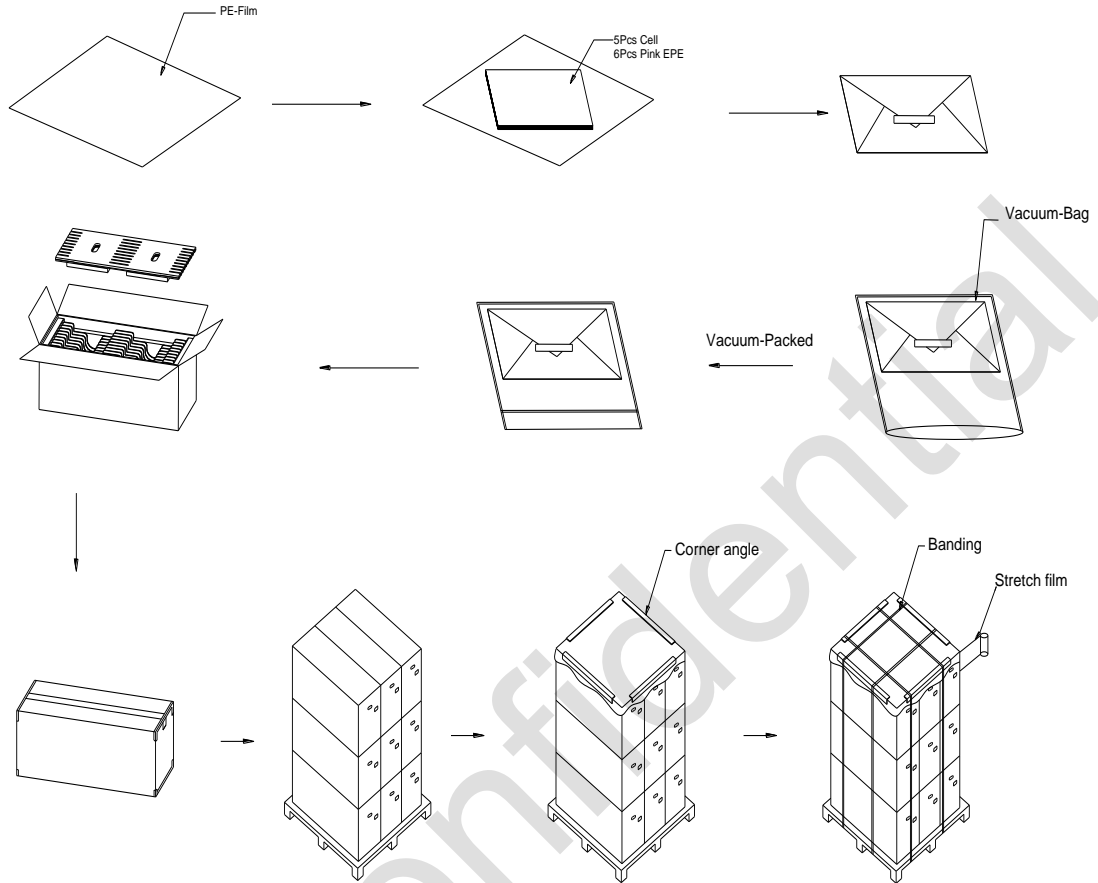


Figure 18 Sub sheet Packaging

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	22/23
Document No.		Issue date	2018/12/13	Revision	00

10 General Precaution

10.1 Use Restriction

This product is not authorized for use in life supporting systems, aircraft navigation control systems, military systems and any other application 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°C
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 Handing 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°C and 35°C 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 Disposal

When disposing LCD panel, obey the local environmental regulations.

Document Title	C050SWAK-3 Customer Approval Specification			Page No.	23/23
Document No.		Issue date	2018/12/13	Revision	00

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	<p>备注: 遮光板边缘距离AA区$a \geq 2\text{mm}$</p>	<p>备注: 遮光板边缘距离AA区$a \geq 2\text{mm}$</p>	<ol style="list-style-type: none"> 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$a \geq 2\text{mm}$ 3、中板玻璃边缘进行UV密封胶, 渗胶量$\geq 1\text{mm}$ 4、将产品缓慢推进固化炉固化 5、固化期间玻璃表面温度$< 70^\circ\text{C}$
		传动 固化	<p>备注: 遮光板边缘距离AA区$a \geq 2\text{mm}$</p>	<p>备注: 遮光板边缘距离AA区$a \geq 2\text{mm}$</p>	<ol style="list-style-type: none"> 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$a \geq 2\text{mm}$ 3、中板玻璃边缘进行UV密封胶, 渗胶量$\geq 1\text{mm}$ 4、将产品平稳放入传送带 5、固化期间玻璃表面温度$< 70^\circ\text{C}$
	垂直 固化	<p>备注: 遮光板间隙大小设计$1.5 \pm 0.2\text{mm}$</p>	<p>备注: 玻璃边缘与遮光板面齐平</p>		<ol style="list-style-type: none"> 1、将中板玻璃垂直插入密封胶架 2、中板玻璃边缘进行UV密封胶, 渗胶量$\geq 1\text{mm}$ 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$1.5 \pm 0.2\text{mm}$), 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$< 70^\circ\text{C}$
研磨	尺寸	研磨实测压力管控		研磨时间管控	
	$\leq 7''$	$\leq 60\text{g}/\text{cm}^2$		$\leq 6\text{min}/\text{面}$	
	$> 7''$	$\leq 50\text{g}/\text{cm}^2$		$\leq 3\text{min}/\text{面}$	