Customer Approval Specification

To:

Product Name: U060SWR8-0

Document Issue Date: 2020/01/19

	InfoVision Optoelectronics
SIGNATURE _____ _____ _____	**SIGNATURE** **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.

Revision	Date	Page	Old Description	New Description	Remark
V00	2020/01/07	-	-	--	-
V01	2020/01/19	-	-	Update Cell Light-On Information -	-

CONTENTS

1 General Descriptions

1.1 Introduction

The U060SWR8-0 is a color active matrix thin film transistor (TFT) liquid crystal display (LCD) with Sub sheet that uses amorphous silicon TFT as a switching device. This TFT LCD panel 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
- In-cell Touch 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)	70.04 x141.08x 0.80		mm	Single Chip
Active Area (H x V)	68.04x136.08		mm	Single Chip
Number of Pixels (H x V)	720 x1,440		-	Single Chip
Pixel Size (H x V)	0.0945 x 0.0945		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			
Sensor Interface	I^2C		-	MIPI
Multi touch	10		Point	-
Report Rate	120		Hz	Long-H
Driver IC(Recommendation)	(HX83102D)/(ILI9881H)		-	-
Weight	(512.45) (Typ.)	(548.33) (Max.)	g	Sub A Sheet
	(389.08) (Typ.)	(416.32) (Max.)	g	Sub B Sheet

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	-40	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	(-2.375)	(-1.875)	(-1.375)	V
2	Frame Rate	-	(60)	-	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		(3.4)	(3.8)	-	%	Under C-light (1),(5),(7),(8) ,(10) θx=θy=0°
Contrast Ratio	Center		(900)	(1,200)	-	-	(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. (-0.02)	(0.660)	Typ. (+0.02)	-	Under C-light (1),(5),(8) θx=θy=0°
	Red y			(0.321)		-	
	Green x			(0.281)		-	
	Green y			(0.598)		-	
	Blue x			(0.138)		-	
	Blue y			(0.102)		-	
	White x			(0.301)		-	
	White y			(0.334)		-	
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)	-		

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.

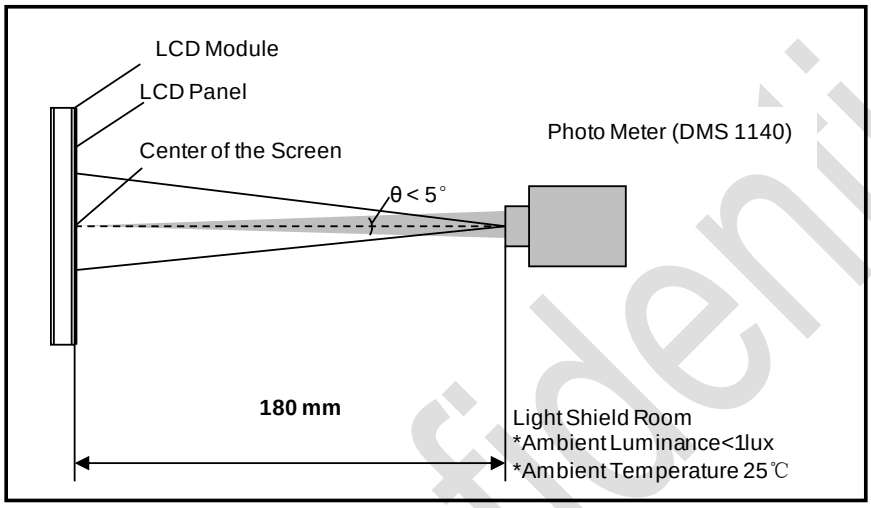


Figure 1 Optical Characteristic Measurement Equipment and Method

Note(2) Definition of Viewing Angle.

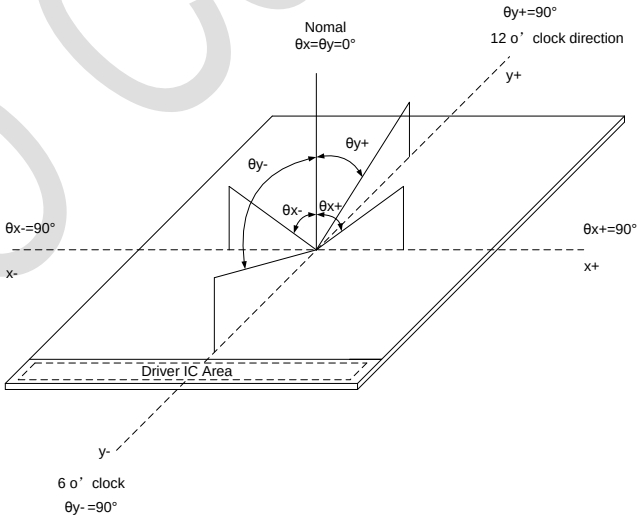


Figure 2 Definition of Viewing Angle

Note(3) Definition of Contrast Ratio (CR)

The contrast ratio can be calculated by the following expression:

Contrast Ratio (CR) = the luminance of White pattern/the luminance of Black pattern

Note(4) Definition of Response Time

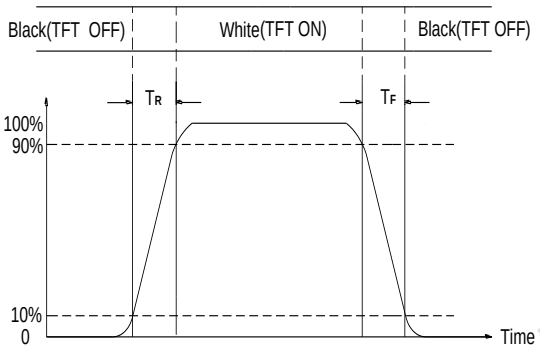


Figure 3 Definition of Response Time

Note(5) C-light Spectrum

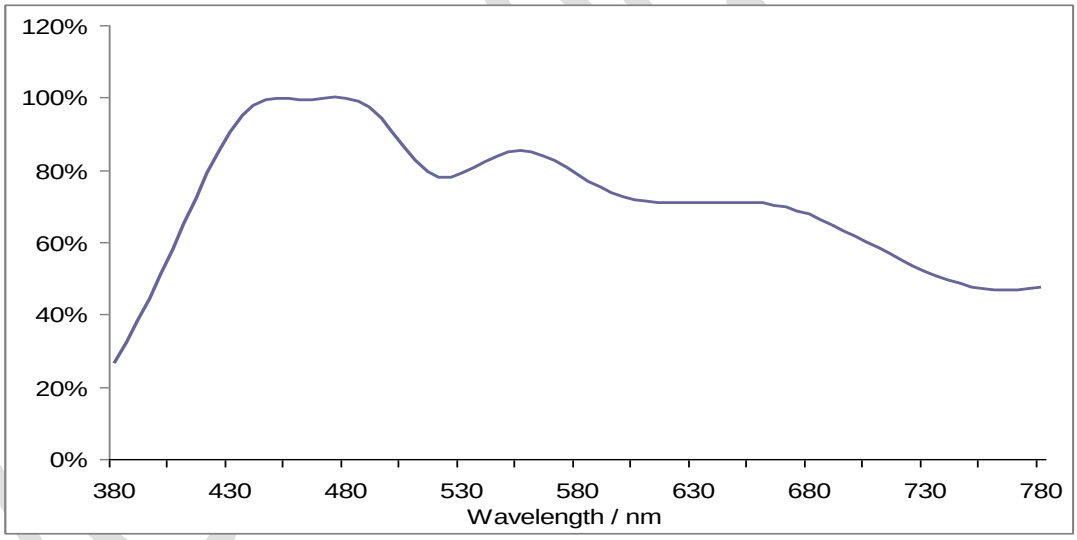


Figure 4 C-Light Spectrum

Note(6) The Back Light Spectrum.

TBD

Figure 5 BL Spectrum

Note(7) The polarizer type: TBD

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.

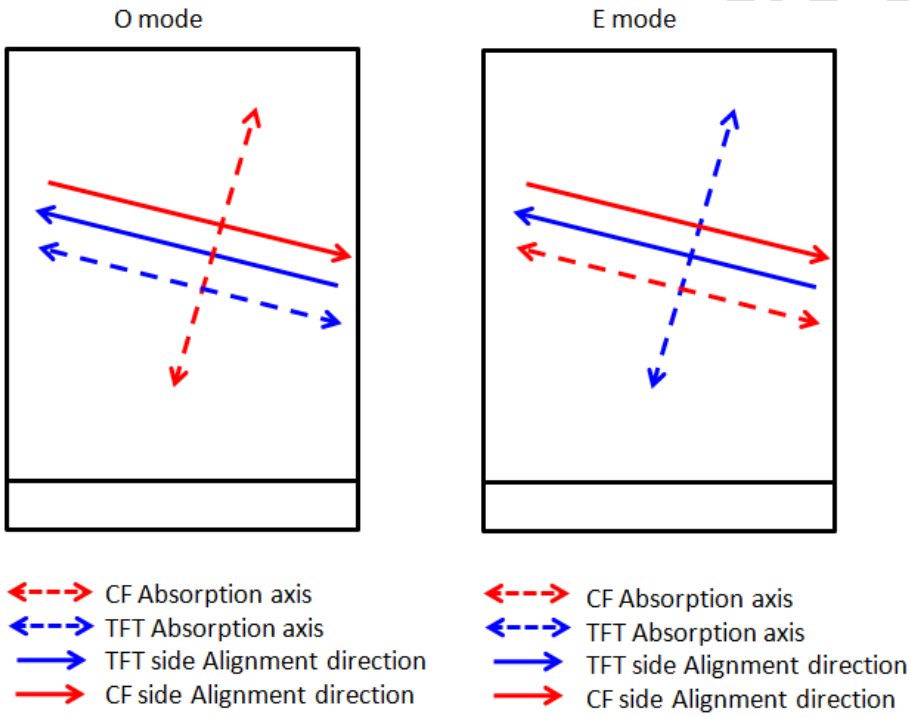


Figure 6 Polarizer Direction

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.

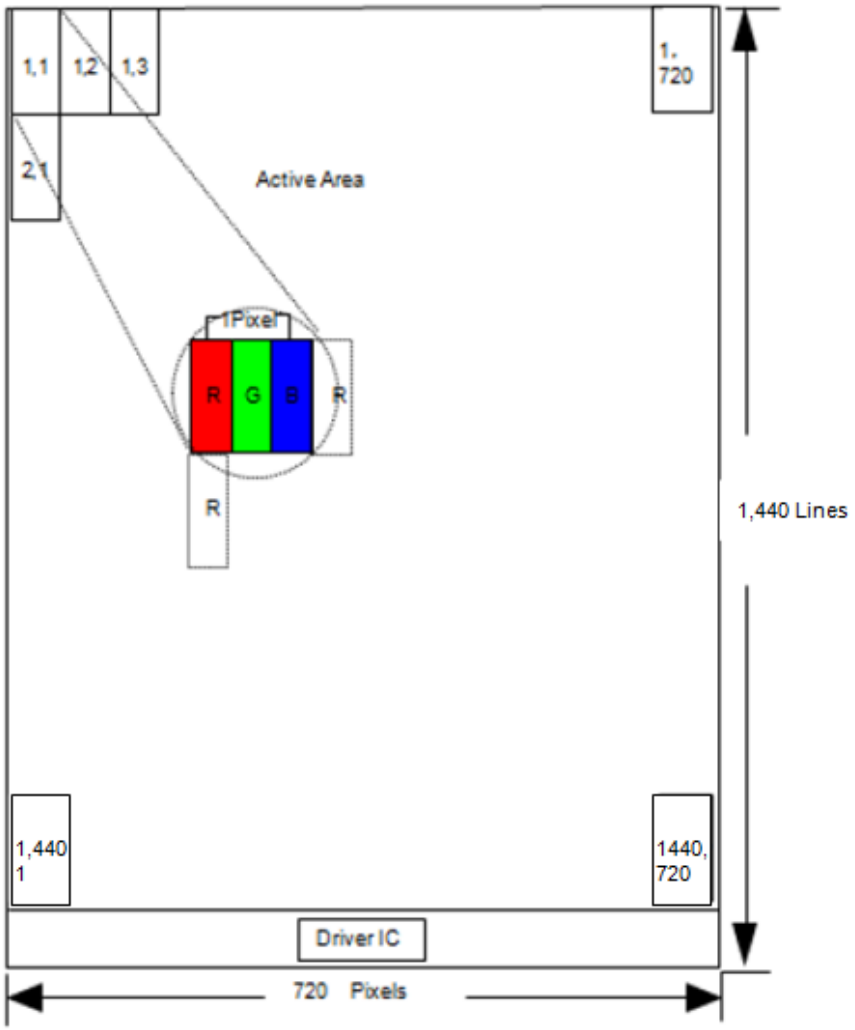
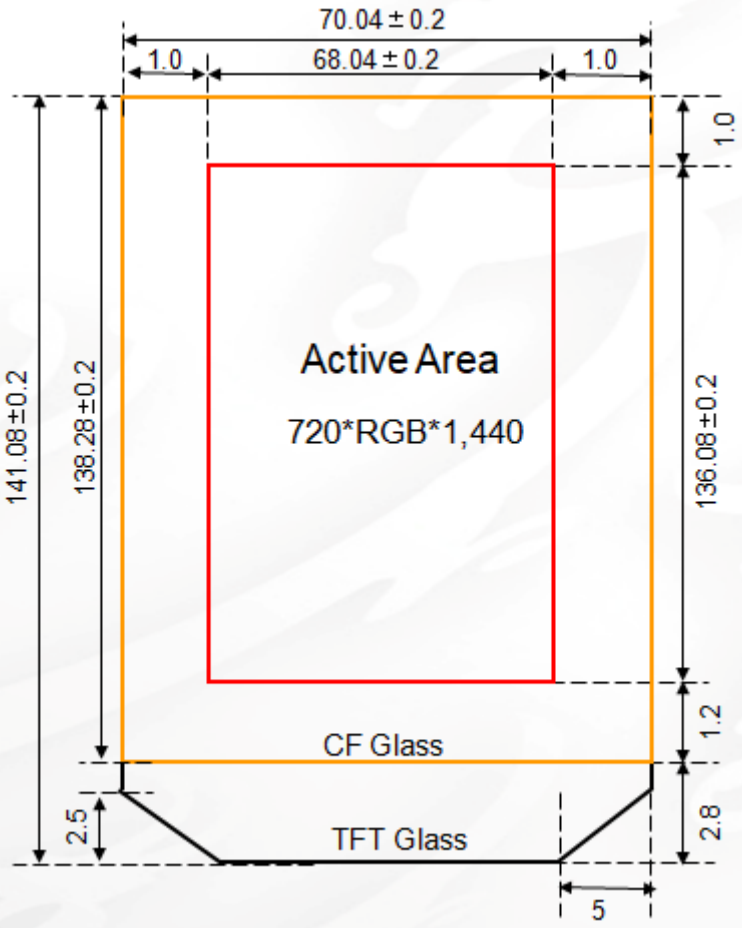


Figure 7 Pixel Format

6 Outline Size

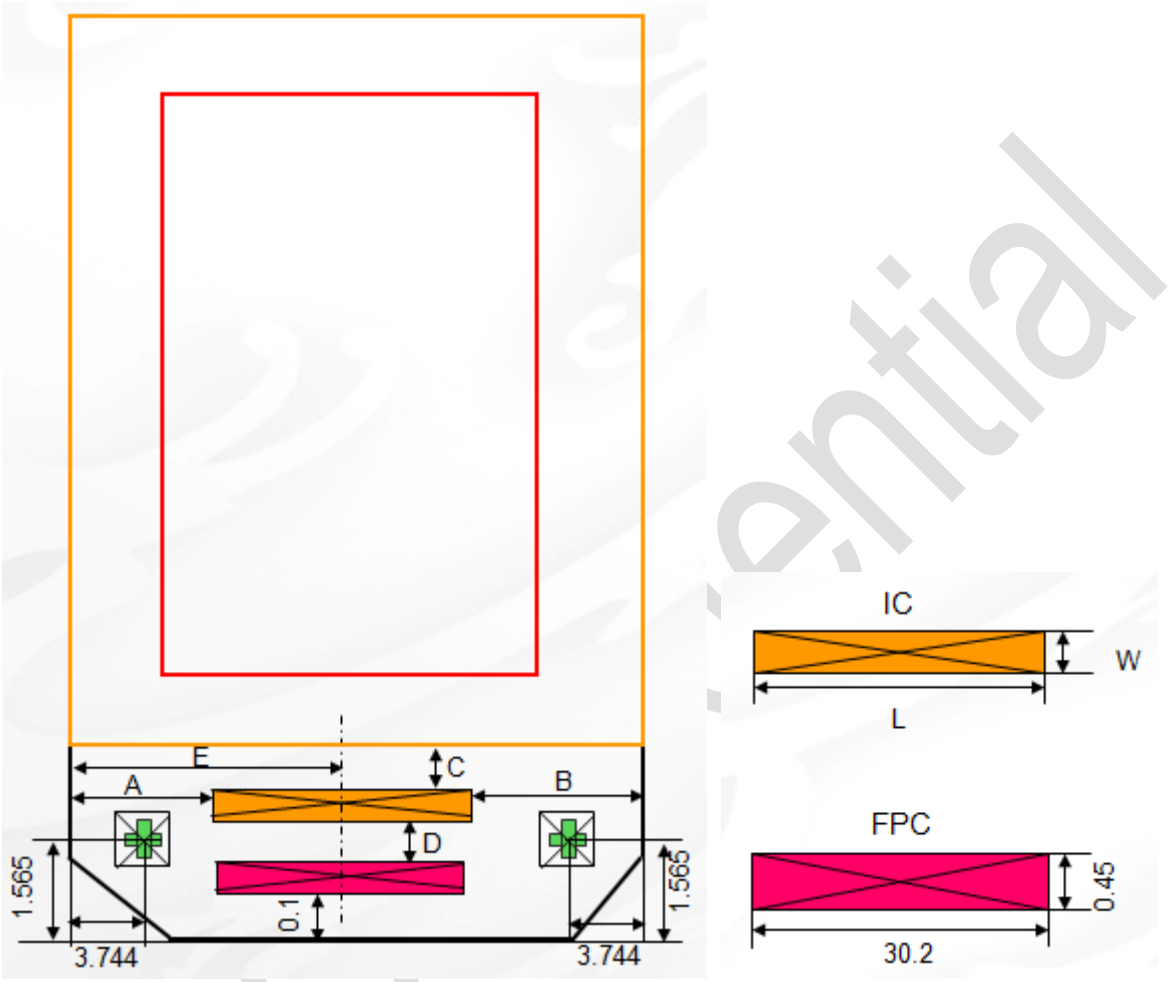
6.1 Outline Size of Single Chip



Unit: mm

Figure 8 Outline Size of Single Chip

6.2 IC & FPC Position On Cell

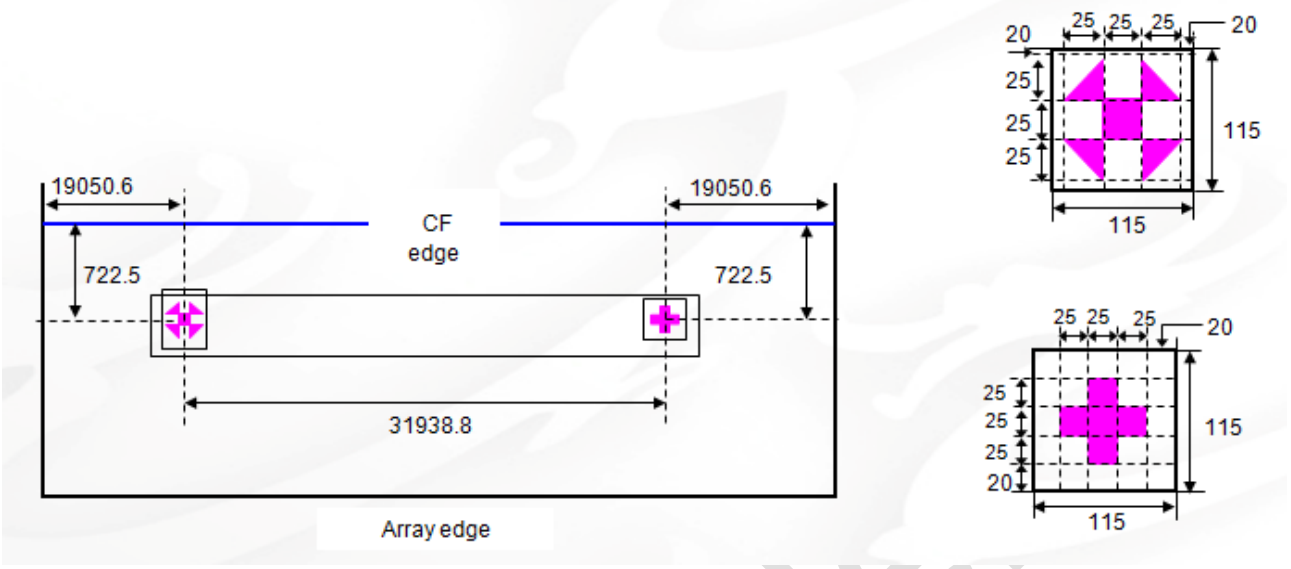


Unit: mm

Figure 9 IC and FPC Position information

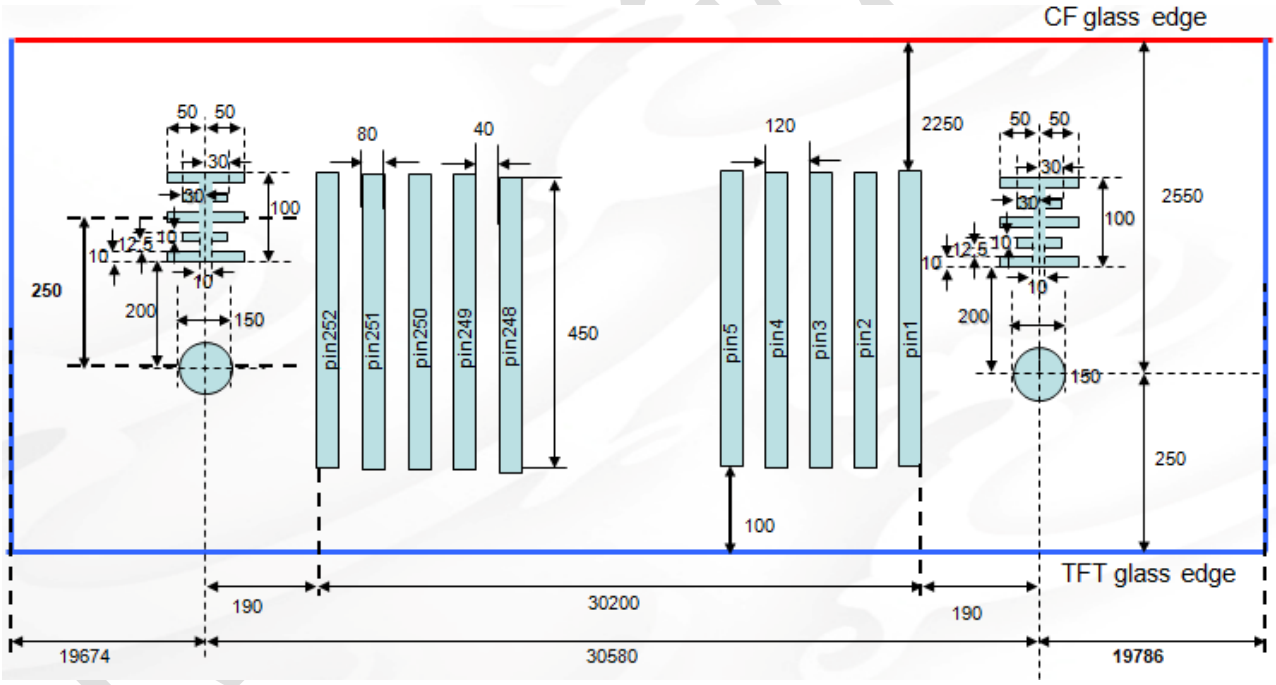
Table 5 IC Position information

IC name	L(mm)	W(mm)	A(mm)	B(mm)	C(mm)	D(mm)	E(mm)
(HX83102D)	(32.18)	(1.046)	(18.93)	(18.93)	(0.624)	(0.58)	(35.02)
(ILI9881H)	(32.136)	(1.1)	(18.952)	(18.952)	(0.627)	(0.523)	(35.02)



Unit: um

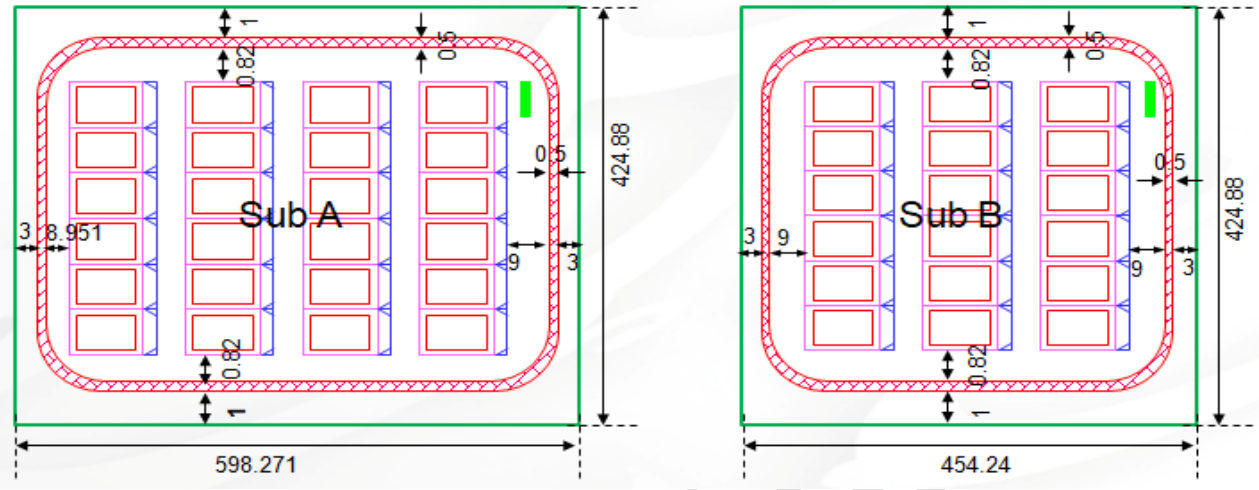
Figure 10 IC Position Information



Unit: um

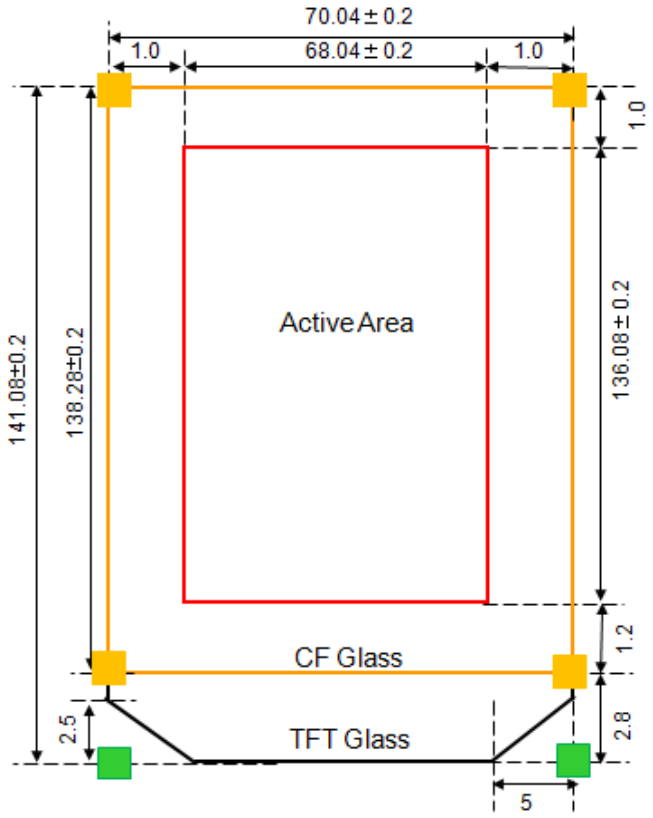
Figure 11 FPC Position Information

6.3 Outline Size of Sub Sheet and Cut Mark

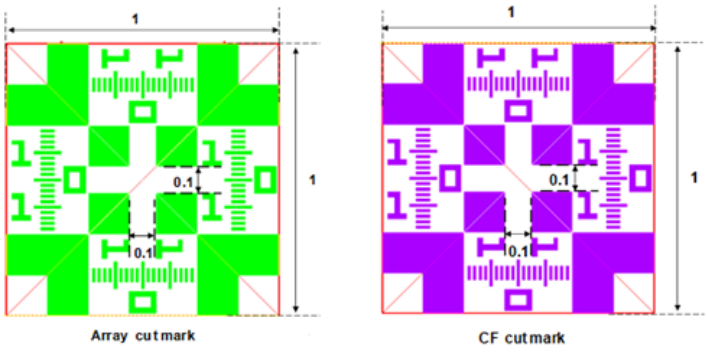


Unit: mm

Figure 12 Outline Size of Sub A & Sub B



Unit：mm



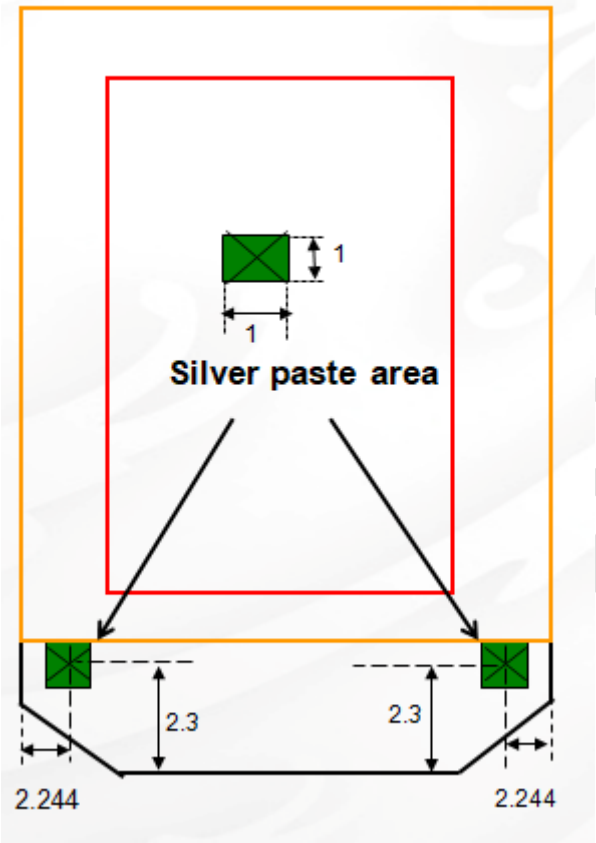
Unit: mm

Figure 13　Outline Size of Cut Mark

6.4 Cell Thickness

Figure 14 Cell Thickness

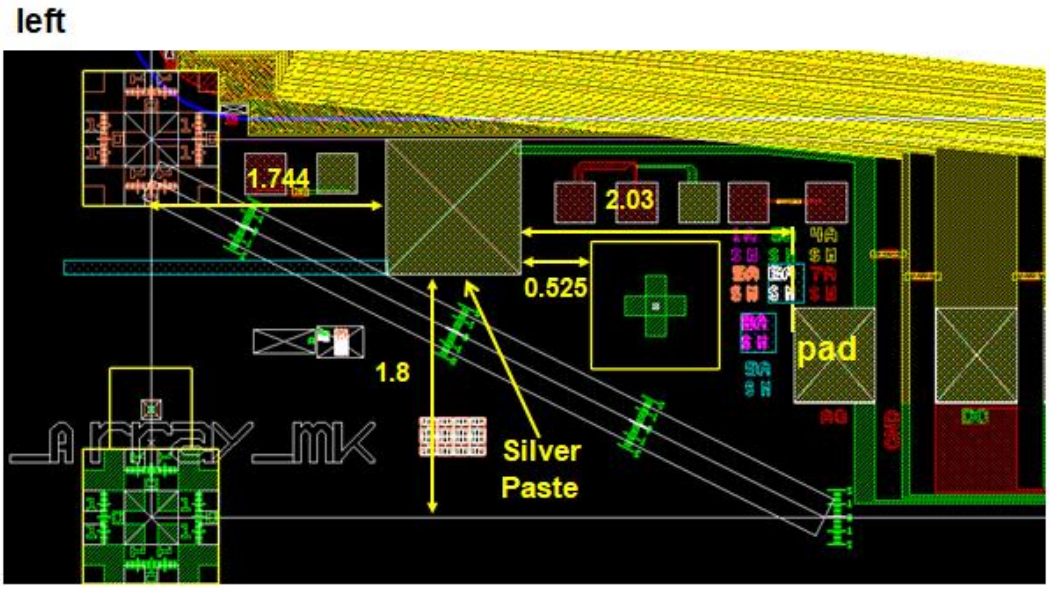
6.5 Silver Paste Position



Unit: mm

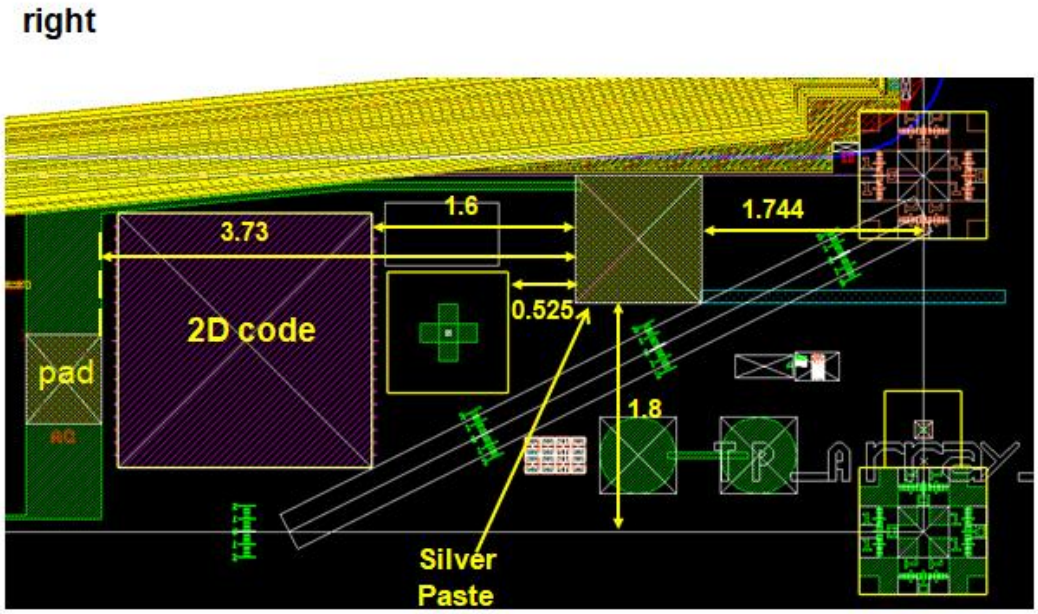
Figure 15 Silver Paste Position

6.6 Silver Paste on the Pad



Unit: mm

Figure 16 Silver Paste On the Left Pad

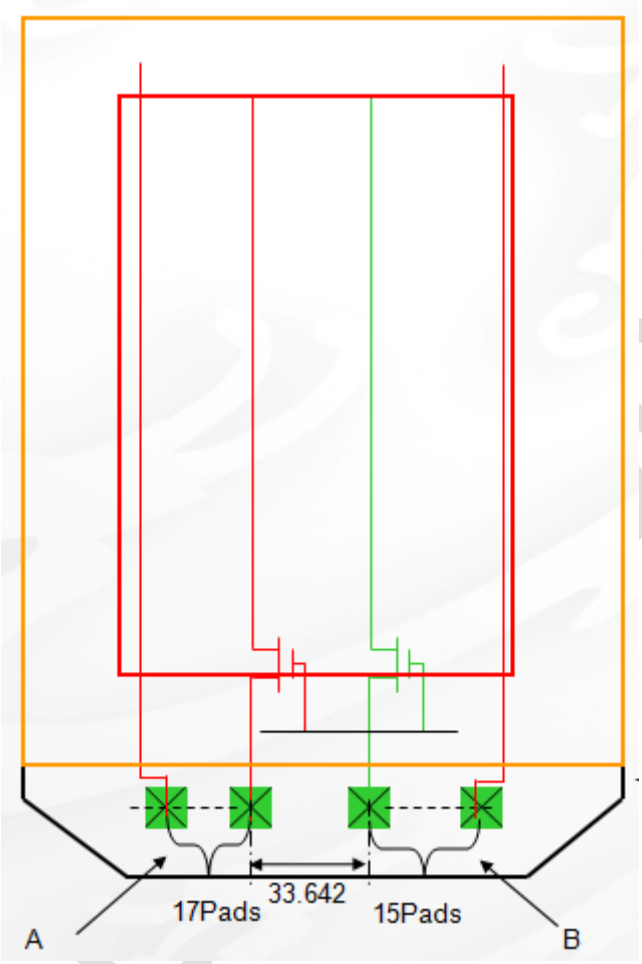


Unit: mm

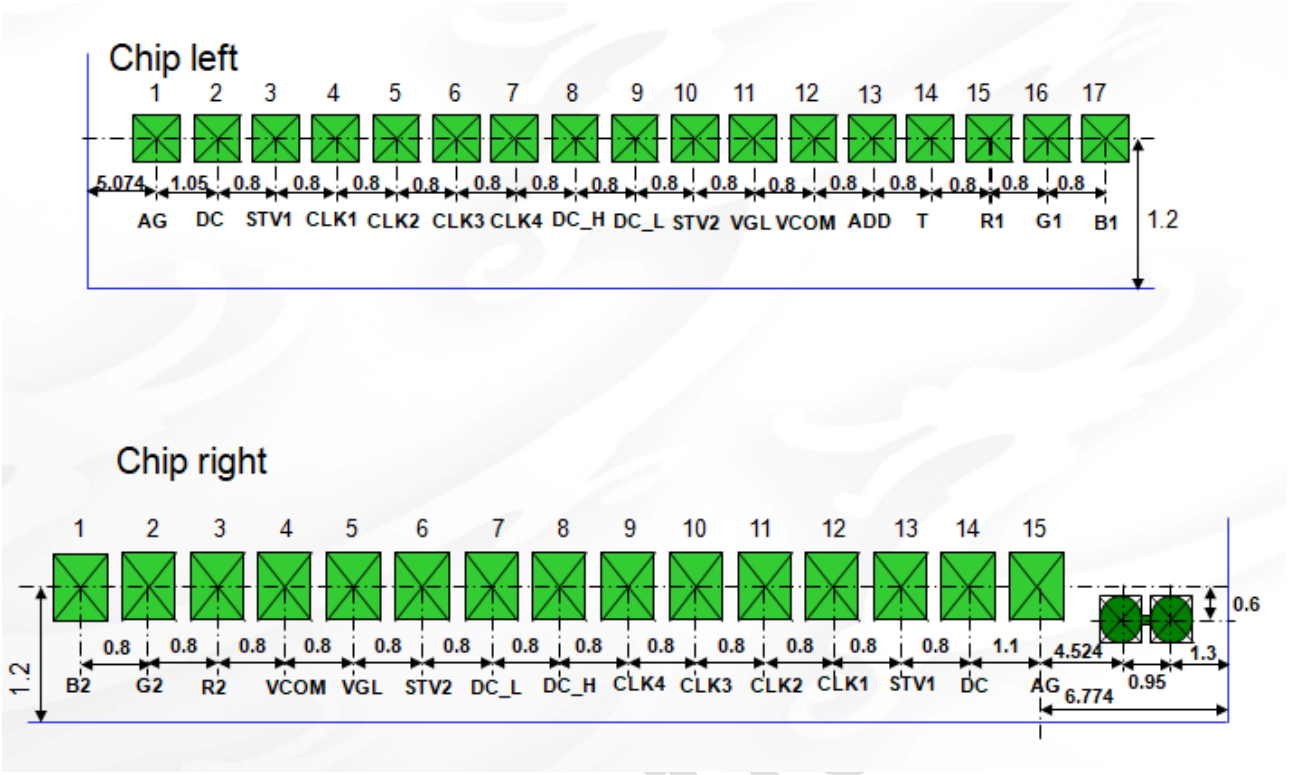
Figure 17 Silver Paste On the Right Pad

7 Cell Light-On Information

7.1 Cell Light-On Test Pad Drawing



Unit: mm



Unit: mm

Figure 18 Cell Light-On Test Pad Drawing

Note：DC_H:15V,DC_L:-11V .

7.2 Cell Light-On Test Waveform

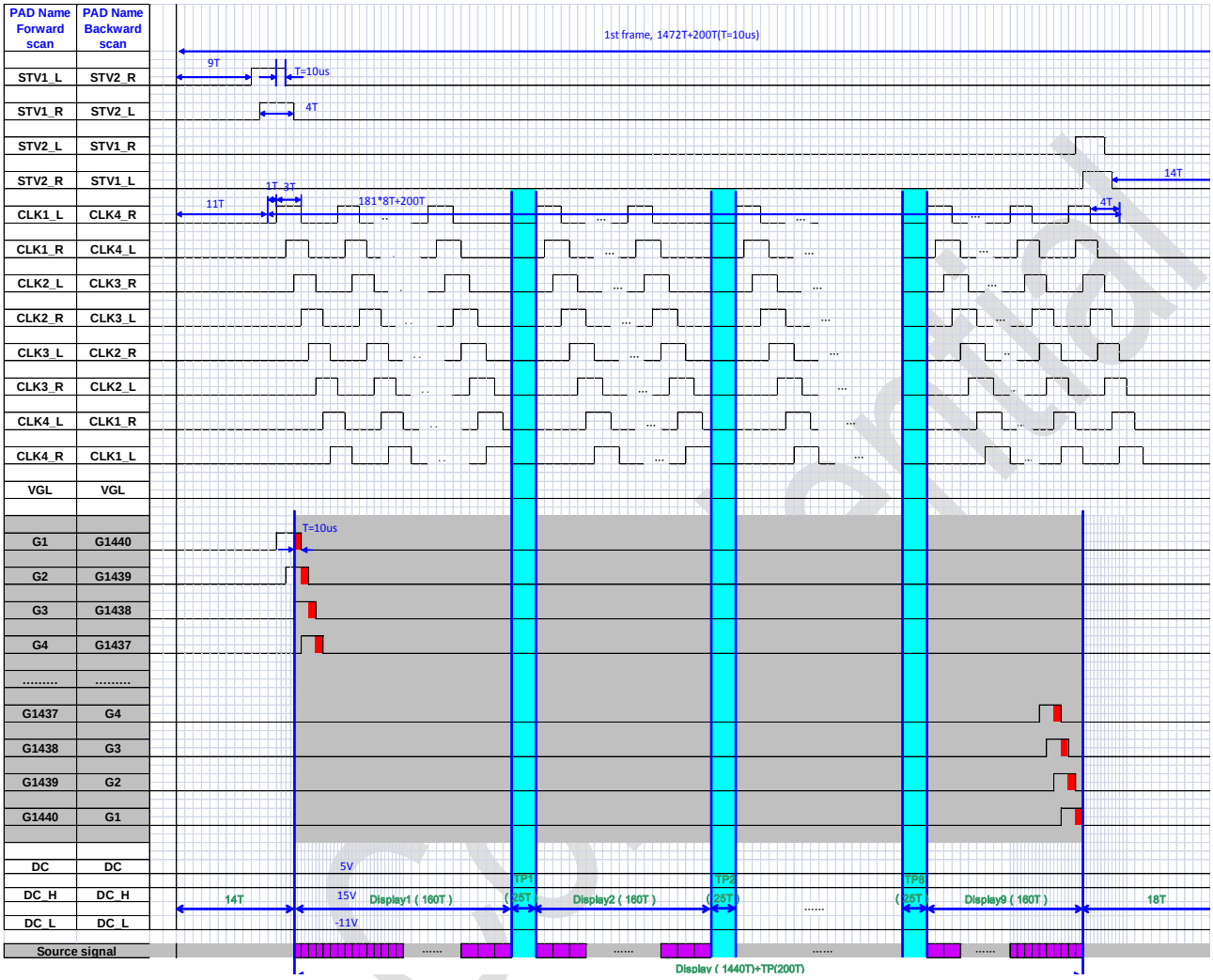


Figure 19 Cell Light-On Test Waveform

Table 6 Voltage for Cell Test

VGH	(15)V			
VGL	(-11)V			
Vcom	(-1.875)V			
DC	(5~10)V			
Pattern	White	Black	50% Gray	25% Gray
VDH(R/G/B)	(5)V	(0.2)V	(3.3)V	(2.8)V
VDL(R/G/B)	(-5)V	(-0.2)V	(-3.3)V	(-2.8)V

Note:DC can connect with VSP.

7.3 LCD FPC Input Pin Assignment

Table 7 LCD FPC Input Pin Assignment

HX83102D:

No.	Pin definition	No.	Pin definition	No.	Pin definition	No.	Pin definition	No.	Pin definition	No.	Pin definition	No.	Pin definition
1	TEST1	37	NVREF	73	VDDD	109	VSSD	145	VDD1	181	VSSAC	217	VSSA
2	GND	38	VCL	74	VSSD	110	VDDD	146	VSSD	182	VSSAC	218	VSN
3	DC	39	VGHO	75	VSSD	111	VDDD	147	VSSD	183	VREF	219	VCOM_OPT_R
4	VSSD	40	VSP	76	VSSD	112	VDD1	148	VDD1	184	VSPR	220	VCOM_OPT_R
5	VDD1	41	VSP	77	HS_VCC	113	VSSA	149	VDD1	185	VSNR	221	VCOM
6	DUMMY[23]	42	VSP	78	HS_VCC	114	VSN	150	GPIO[6]	186	VDD3	222	VCOM_FB
7	DUMMY[24]	43	VGH	79	HS_VCC	115	VCOM	151	GPIO[6]	187	VDD3	223	VCOM_FB
8	AFE_TEST[0]	44	C21P	80	HS_VCC	116	DUMMY[50]	152	GPIO[7]	188	VDD3	224	VCOM_PASS_R
9	AFE_TEST[1]	45	C21N	81	HS_LDO	117	DUMMY[52]	153	GPIO[7]	189	VSSD	225	VSSD
10	VGLO	46	VSP	82	HS_VSS	118	DUMMY[54]	154	DUMMY	190	VSSD	226	NVCCAREGT
11	VGH2	47	VSN	83	D2P	119	DUMMY[56]	155	FLASH_SPI_CS	191	VSSD	227	NVCCAT
12	VGH1	48	VSN	84	D2N	120	DUMMY[70]	156	FLASH_SPI_SCL	192	VSSD	228	NVREFT
13	VSSACT	49	VSSD_P	85	HS_VSS	121	DUMMY[71]	157	FLASH_SPI_MOSI	193	VDD1	229	NVREFT
14	SHK[1]	50	VSSD_P	86	HS_VSS	122	DUMMY[71]	158	FLASH_SPI_MISO	194	VDD1	230	VSP
15	SHK[2]	51	C22P	87	D1P	123	DUMMY[72]	159	FLASH_HOLD	195	VDD1	231	VSSAT
16	SHK[3]	52	C22N	88	D1N	124	DUMMY[73]	160	FLASH_WP	196	VCL	232	LED[4]
17	LED[1]	53	VSP	89	HS_VSS	125	DUMMY[76]	161	TP_RESX	197	VSSA	233	LED[5]
18	LED[2]	54	VSP	90	HS_VSS	126	TP_SPI_SCL	162	TP_I2C_SCL	198	C42P	234	LED[6]
19	LED[3]	55	VDD3	91	CP	127	TP_SPI_MOSI	163	TP_I2C_SDA	199	C42P	235	SHK[4]
20	VSSAT	56	C41P	92	CN	128	CABC_PWM_OUT	164	TSIX	200	C42N	236	SHK[5]
21	VSP	57	C41N	93	HS_VSS	129	TP_SPI_MISO	165	VGSP	201	C42N	237	SHK[6]
22	NVREFT	58	C41N	94	HS_VSS	130	TP_SPI_CS	166	VGSN	202	VSN	238	VSSACT
23	NVREFT	59	VSSD_OSC	95	D0P	131	TE1	167	VSSD	203	VSSD_P	239	VGH1
24	NVCCAT	60	VSSD_OSC	96	D0N	132	MCU_EN	168	VSSD	204	VSP	240	VGH2
25	NVCCAREGT	61	VSSD	97	HS_VSS	133	TE	169	VDDD	205	C31P	241	VGHO
26	VSSD	62	VSSD	98	HS_VSS	134	BIST_EN	170	VDDD	206	C31N	242	AFE_TEST[2]
27	VCOM_PASS_L	63	VSSD	99	D3P	135	BS[0]	171	VDDD	207	VGL	243	AFE_TEST[3]
28	VCOM	64	VSSD	100	D3N	136	BS[1]	172	VDD1	208	VGL	244	DUMMY[99]
29	VCOM_OPT_L	65	VDDD	101	HS_VSS	137	PNSWAP	173	VDD1	209	VGLO	245	DUMMY[100]
30	VCOM_OPT_L	66	VDD1	102	HS_VSS	138	LANSEL[0]	174	VDD1	210	VMD	246	DUMMY[102]
31	VSN	67	VDD1	103	HS_LDO	139	LANSEL[1]	175	VDDD	211	VSP	247	DUMMY[103]
32	VSSA	68	VDD1	104	HS_LDO	140	GPIO[5]	176	VDDD	212	VTESTOUTP	248	VDD1
33	VPP	69	VDD1	105	HS_VCC	141	DUMMY	177	VSP_G	213	VTESTOUTP	249	VSSD
34	VPP	70	VDDD	106	HS_VCC	142	RESX	178	VSP_G	214	VTESTOUTN	250	DC
35	VPP	71	VDDD	107	HS_VCC	143	EXT_OSC	179	VSSA_G	215	VTESTOUTN	251	GND
36	VPP	72	VDDD	108	VSSD	144	VDD1	180	VSN_G	216	DUMMY	252	TEST2

Note：Pin3 and pin250 DC voltage is set tentatively between 5V~10V, which needs to be adjusted during validation.

ILI9881H：

No.	Pin definition	No.	Pin definition	No.	Pin definition	No.	Pin definition	No.	Pin definition	No.	Pin definition	No.	Pin definition
1	TEST1	37	AVDD	73	VDD	109	VSS	145	VDDI	181	AVDD	217	TAVSS_R
2	GND	38	TVCH_L	74	VSS	110	VDD	146	VSS	182	AVDD	218	AVEE
3	DC	39	TVCL_R	75	VSS	111	VDD	147	VSS	183	AVSS	219	VCOM_OPT_R
4	VGLO_L	40	VDD	76	VSS	112	AVDD	148	VDDI	184	GVDDP	220	VCOM_OPT_R
5	VGHO_L	41	VDD	77	VDDAM	113	AVSS	149	VDDI	185	GVDDN	221	VCOM_R
6	COGTEST[1]	42	VDD	78	VDDAM	114	AVEE	150	TP_UART_TX	186	VDD	222	AVSS
7	COGTEST[2]	43	VGH	79	VDDAM	115	VCOM	151	TP_TCKC	187	VDD	223	AVSS
8	TP_TEST[0]	44	C21P	80	VDDAM	116	VSSDUM[48]	152	TP_TMSC	188	VDD	224	VCOM_PASS_R
9	TP_TEST[1]	45	C21N	81	VP_HSSI	117	VSSDUM[50]	153	TP_GPIO[6]	189	VSS	225	VSS_QVC_R
10	VGL	46	AVDD	82	VG_HSSI	118	VSSDUM[52]	154	TP_GPIO[7]	190	VSS	226	LDO_OUT_R
11	VGH	47	AVEE	83	HSSI_D2_P	119	VSSDUM[54]	155	TP_INT	191	VSS	227	LDO_OUT_R
12	VGH	48	AVEE	84	HSSI_D2_N	120	VSS	156	TP_I2C_SDA	192	VSS	228	VSS
13	TX_0D	49	CVSS	85	VG_HSSI	121	VSS	157	TP_I2C_SCL	193	VDDI	229	VSS
14	RX_0D[0]	50	CVSS	86	VG_HSSI	122	VSS	158	TP_SPI_CS	194	VDDI	230	AVDD_BG_R
15	RX_0D[1]	51	C22P	87	HSSI_D1_P	123	VDD_TP	159	TP_SPI_MISO	195	VDDI	231	AVSS
16	RX_0D[2]	52	C22N	88	HSSI_D1_N	124	VDD_TP	160	TP_SPI_MOSI	196	VDD_TP	232	LED[4]
17	LED[1]	53	AVDD	89	VG_HSSI	125	TEST[0]	161	TP_SPI_SCLK	197	VCIP_R	233	LED[5]
18	LED[2]	54	AVDD	90	VG_HSSI	126	FTE	162	TP_FLASH_CS	198	EXTP	234	LED[6]
19	LED[3]	55	CVSS	91	HSSI_CLK_P	127	FTE1	163	TP_FLASH_MISO	199	EXTP	235	RX_1D[2]
20	AVSS	56	VCIP_L	92	HSSI_CLK_N	128	LEDPWM	164	TP_FLASH_MOSI	200	EXTN	236	RX_1D[1]
21	AVDD_QVC_L	57	VCL	93	VG_HSSI	129	PNSWAP	165	TP_FLASH_SCK	201	EXTN	237	RX_1D[0]
22	VSS	58	VCL	94	VG_HSSI	130	IM[0]	166	TP_TEST_EN	202	AVDD	238	TX_1D
23	VSS	59	AVSS	95	HSSI_D0_P	131	IM[1]	167	VSS	203	CVSS	239	VMOD_GATE
24	LDO_OUT_L	60	AVSS	96	HSSI_D0_N	132	DSWAP[0]	168	VSS	204	VCL	240	VMOD_GATE
25	LDO_OUT_L	61	VSS	97	VG_HSSI	133	DSWAP[1]	169	VDD	205	C31P	241	VGL
26	VSS_QVC_L	62	VSS	98	VG_HSSI	134	FRM	170	VDD	206	C31N	242	TP_TEST[6]
27	VCOM_PASS_L	63	VSS	99	HSSI_D3_P	135	RESX	171	VDD	207	VGL	243	TP_TEST[7]
28	VCOM_L	64	VSS	100	HSSI_D3_N	136	TP_RESX	172	VDDI	208	VGL	244	COGTEST[3]
29	VCOM_OPT_L	65	VDD_TP	101	VG_HSSI	137	TP_GPIO[0]	173	VDDI	209	TVCL_R	245	COGTEST[4]
30	VCOM_OPT_L	66	VDDI	102	VG_HSSI	138	TP_GPIO[1]	174	VDDI	210	TVCH_R	246	VGHO_R
31	AVEE	67	VDDI	103	VP_HSSI	139	TP_GPIO[2]	175	VDD_TP	211	AVDD	247	VGHO_R
32	TAVSS_L	68	VDDI	104	VP_HSSI	140	TP_GPIO[3]	176	VDD_TP	212	DUMMY	248	VGHO_R
33	AVSS	69	VDDI	105	VDDI	141	TP_GPIO[4]	177	AVDD	213	DUMMY	249	VGLO_R
34	AVSS	70	VDD	106	VDDI	142	TP_GPIO[5]	178	AVDD	214	DUMMY	250	DC
35	AVSS	71	VDD	107	VDDI	143	TP_EXTCLK	179	AVSS_DC	215	DUMMY	251	GND
36	AVSS	72	VDD	108	VSS	144	VDDI	180	AVEE	216	DUMMY	252	TEST2

Note：Pin3 and pin250 DC voltage is set tentatively between 5V~10V, which needs to be adjusted during validation.

8 TP Specification

Table 8 TP Characteristics

NO.	Test Item	Test Specification	Copper column diameter
1	Accuracy Test	Center≤1mm,Border≤1.2mm	Φ5mm
2	Jitter Test	Max. 0.30mm	Φ5mm
3	Vertical Line Test	Center≤1mm, Border≤1.2mm	Φ5mm
4	Horizontal Line Test	Center≤1mm, Border≤1.2mm	Φ5mm
5	Box Diagonal Line Test	Center≤1mm, Border≤1.2mm	Φ5mm
6	Latency for the first touch	Max. 30ms	-

9 Reliability Condition

Table 9 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=-40℃,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.

IVO Recommended Packaging

10.1 Sub Sheet Packaging

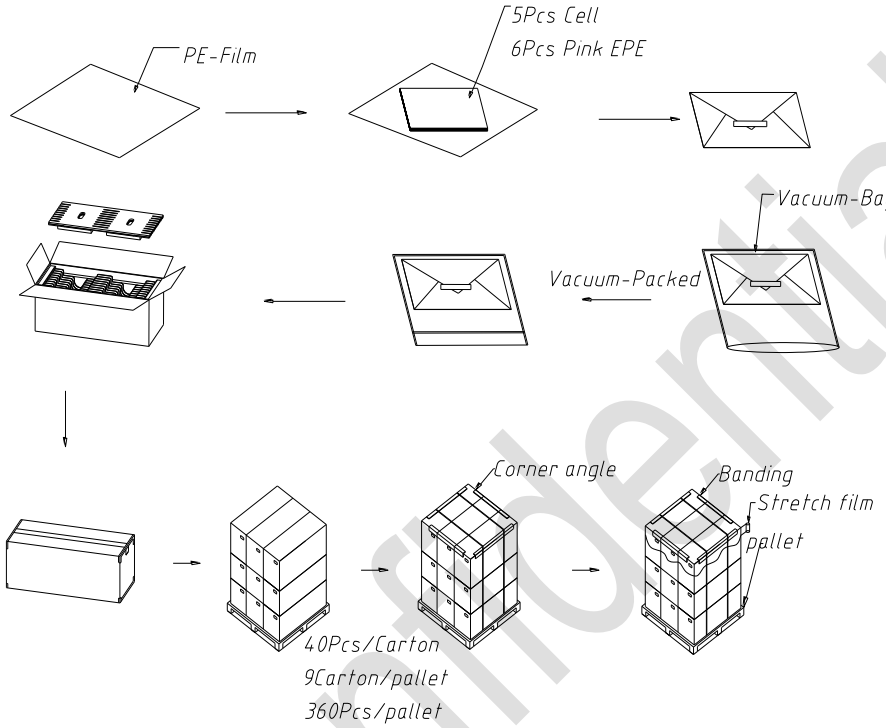


Figure 20 Sub A Packaging

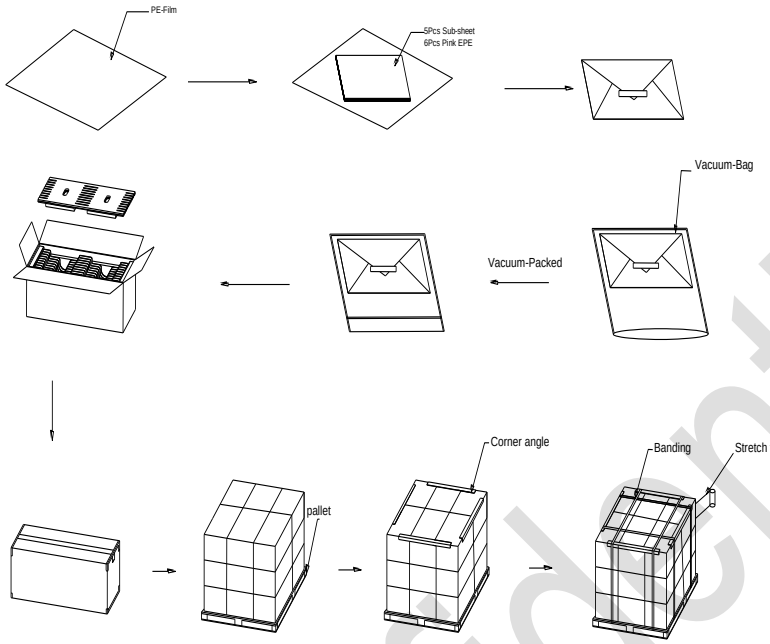


Figure 21 Sub B Packaging

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.