Doc. Number:

■ Tentative Specification
☐ Preliminary Specification
☐ Approval Specification

MODEL NO.: PJ052IC-01C

Customer:

APPROVED BY **SIGNATURE**

Name / Title
Note

Please return 1 copy for your confirmation with your signature and comments.

Approved By	Checked By	Prepared By
Jay Hsu	Tommy Lin	PM

- CONTENTS -

REVISION HISTORY

Version	Date	Page (New)	Section	Description
Ver. 0.0	2016/05/31	All	All	Tentative product spec was first issued for LCD panel.

1. PURPOSE

The specification PJ052IC-01C is a 5.2” LTPS TFT Liquid Crystal Display cell. The cell has been designed by Innolux, and manufactured by Innolux under the agreement of customer. The LTPS TFT-LCD cell will be applied to a high transmittance operating in the normally black mode LTPS TFT-LCD product.

2. GENERAL RULES OF SINGLE PANEL

2.1 GENERAL SPECIFICATION

No.	Item		Specification	unit
1	Glass thickness	TFT	0.2	mm
		CF	0.2	
2	Shipping mode		SUBSTRATE	-
3	Shipping size		620.0 (H) x 750.0 (V) x 0.3 (D)	mm
4	Panel outline dimension		66.40 (H) x 120.89 (V) x 0.3 (D)	mm
5	Active screen size		64.80 x 115.20 (5.2” diagonal)	-
6	Resolution		1080RGB x 1920	pixel
7	Pixel driving element		LTPS TFT	-
8	Sub pixel size		20 x 60	um
9	Pixel arrangement		RGB-stripe	-
10	View direction (Gray inversion)		Free	-
11	Cell gap		3.2 ± 0.3	um
12	Driver IC		NT35695 *<Note>	-
13	Weight without POL		630.26 ± 10%	g

<Note> 1. Compatible IC : NT35596 / OTM1901A / R63315 / HX8399-A / OTM1906A / HX8399-B / R63350 / HX8399C / ILI7807B

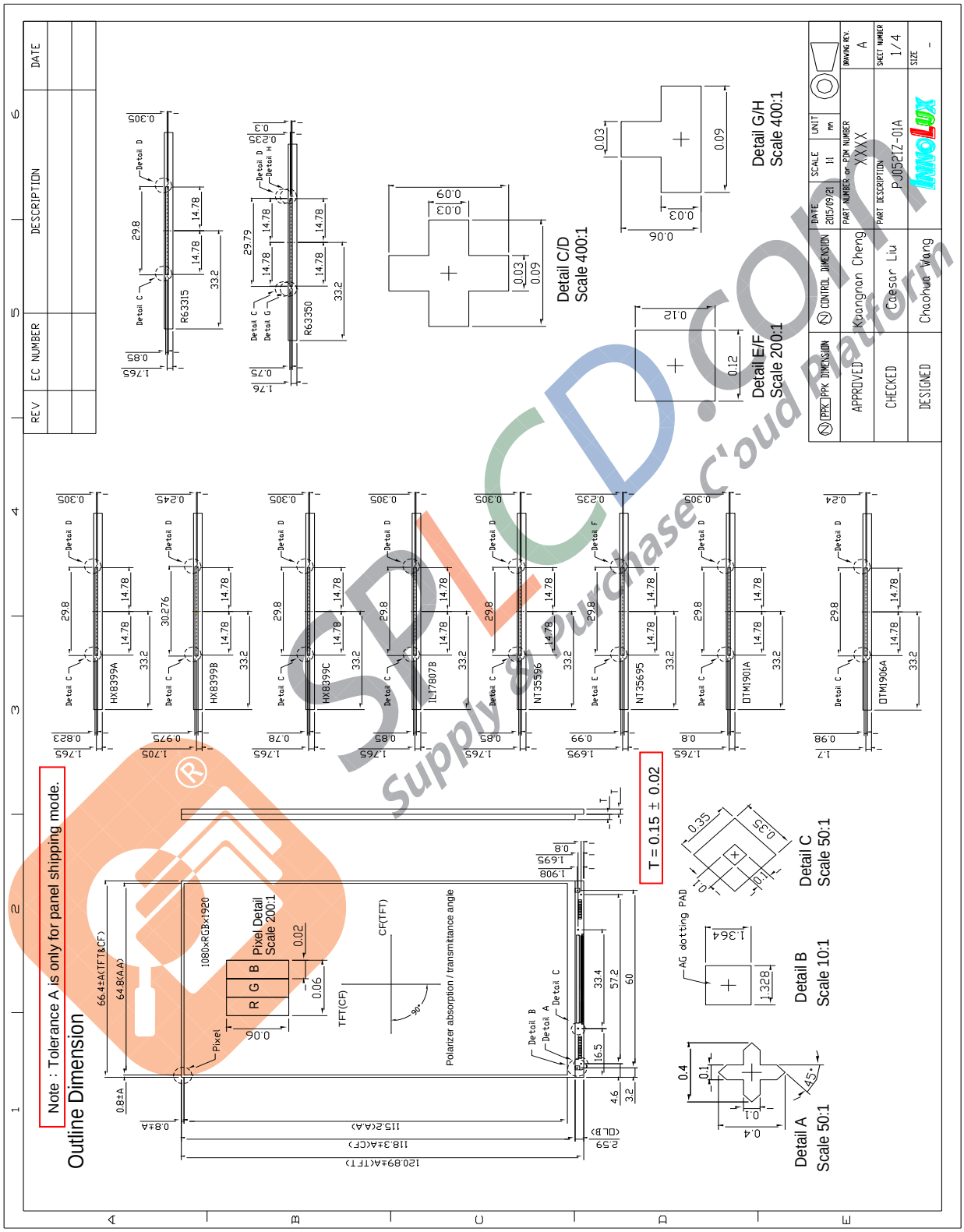
The other compatible ICs are also considered for the design of pad locations.

2. Those compatible IC should be verified for panel performance. Please refer to the IC datasheet (AP note) respectively.

3. This model is designed by the driver IC without bumping compensation.

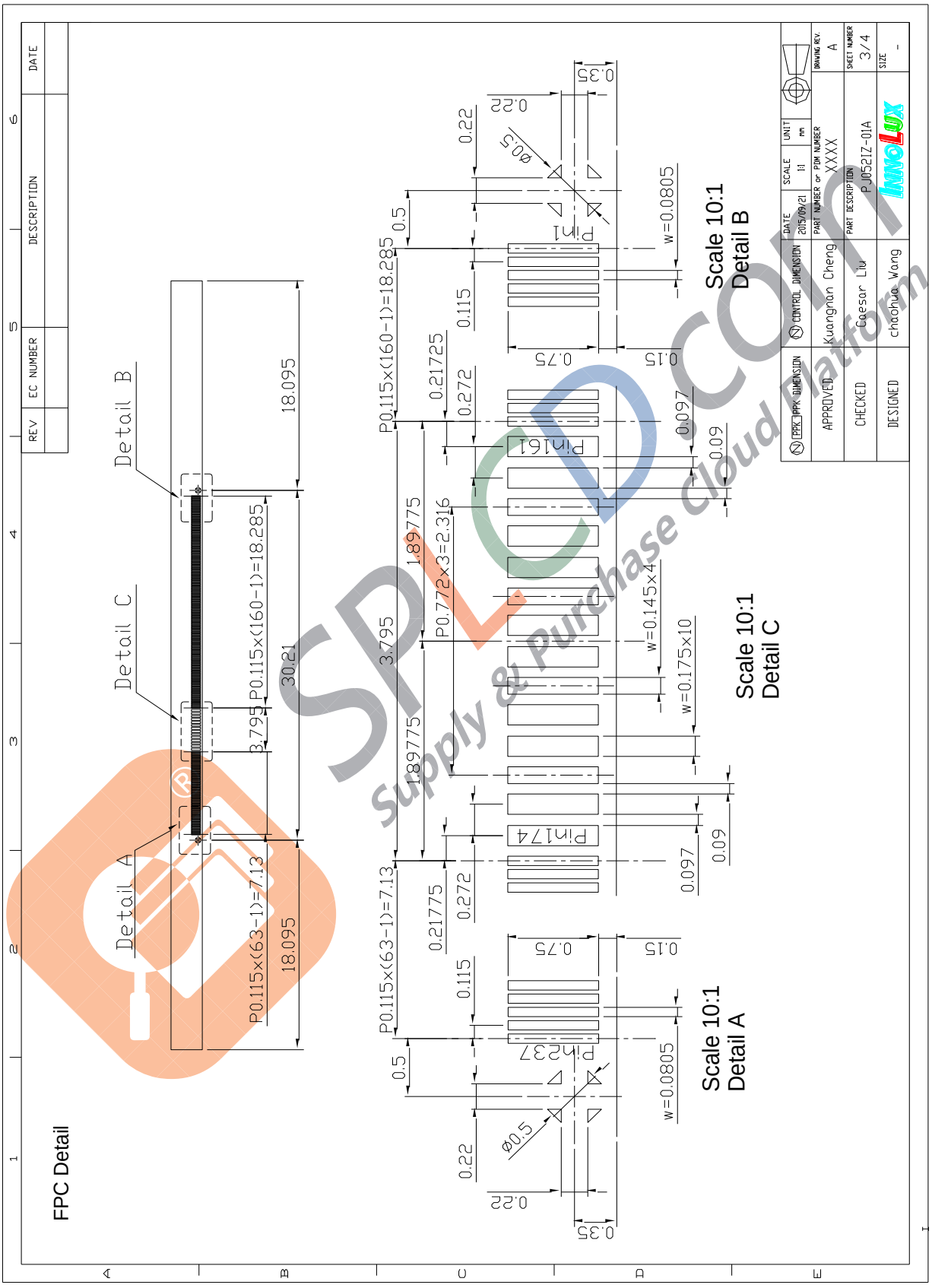
2.2 DIMENSION

2.2.1 OUTLINE DIMENSION

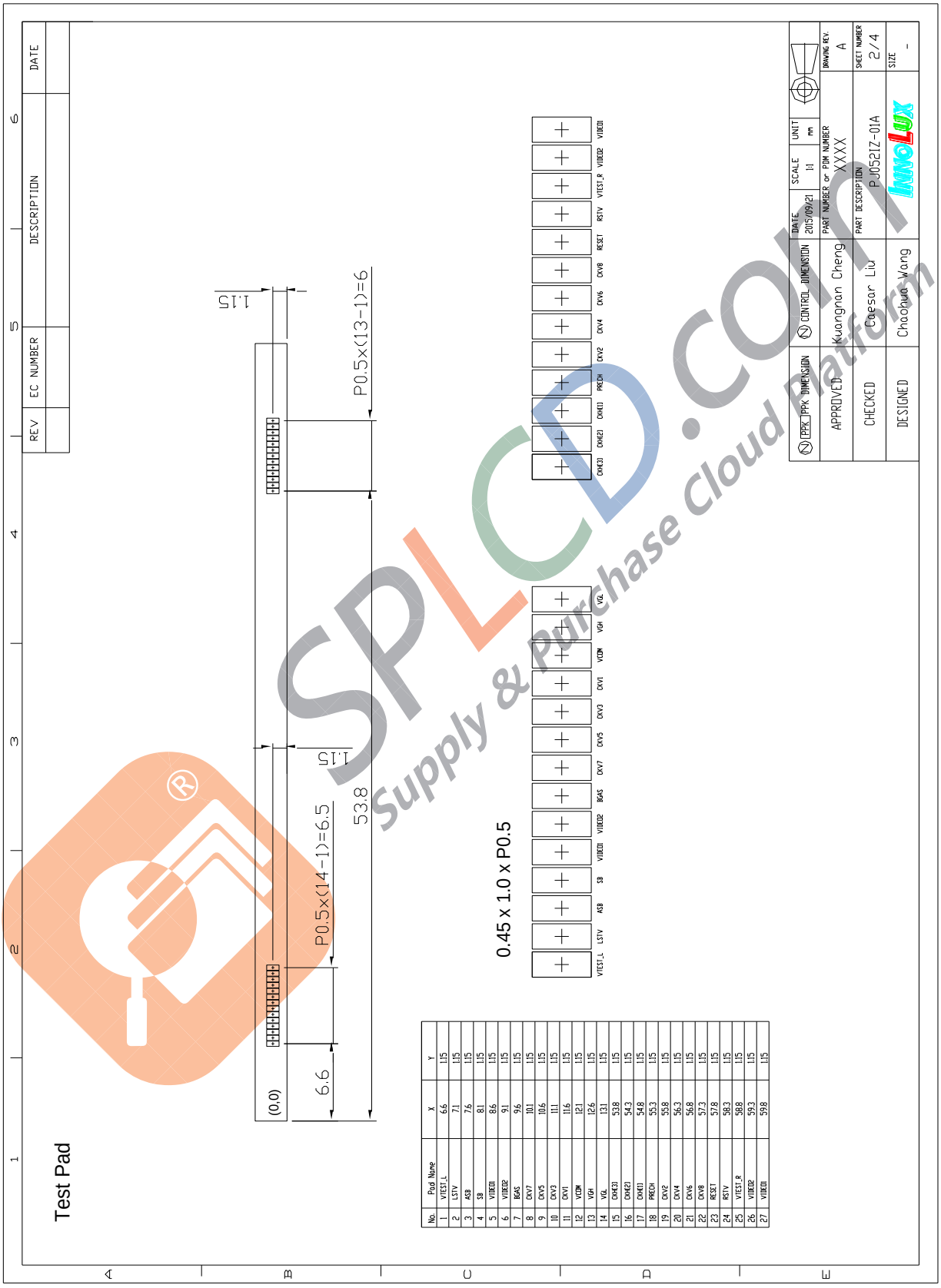


Note: (1) panel outline dimension tolerance ±0.2 mm.

2.2.2 LCD FPC DETAIL



2.2.3 TEST PAD



No.	Pad Name	X	Y
1	VTEST_L	6.6	1.15
2	LSTV	7.1	1.15
3	ASB	7.6	1.15
4	SB	8.1	1.15
5	VIDEO1	8.6	1.15
6	VIDEO2	9.1	1.15
7	BGAS	9.6	1.15
8	CKV7	10.1	1.15
9	CKV5	10.6	1.15
10	CKV3	11.1	1.15
11	CKV1	11.6	1.15
12	VCOM	12.1	1.15
13	VGH	12.6	1.15
14	VGL	13.1	1.15
15	CKH33	53.8	1.15
16	CKH22	54.3	1.15
17	CKH11	54.8	1.15
18	PRECH	55.3	1.15
19	CKV2	55.8	1.15
20	CKV4	56.3	1.15
21	CKV6	56.8	1.15
22	CKV8	57.3	1.15
23	RESET	57.8	1.15
24	RSTV	58.3	1.15
25	VTEST_R	58.8	1.15
26	VIDEO2	59.3	1.15
27	VIDEO1	59.8	1.15

3. PIN ASSIGNMENT

3.1 LCD FPC/IC PIN ASSIGNMENT TABLE

NT35695 application

1	Dummy	31	VSP	61	VCOMDC	91	TE2	121	SVDD
2	Dummy	32	VSP	62	AVSS	92	TE	122	SVDD
3	VSS	33	VSP	63	AVSS	93	TE	123	SVDD
4	VSS	34	VSP	64	AVSS	94	CSX	124	SVDD
5	VCOM	35	EXPWRP	65	VDD	95	DCX	125	VGS
6	VCOM	36	DUMMY	66	VDD	96	WRX/SCL	126	VGS
7	AGND	37	VSWP	67	VDD	97	DOUT	127	VGS
8	AGND	38	VSWP	68	IOVCCRF	98	DIN	128	DUMMY
9	GVSS	39	SVSS	69	IOVCCRF	99	DIN	129	SVSS
10	GVSS	40	SVSS	70	IOVCCRF	100	RESX	130	SVSS
11	GND	41	VSN	71	IOVCC	101	IOVCC	131	SVSS
12	GND	42	VSN	72	IOVCC	102	IOVCC	132	SVSS
13	PBCTLA1	43	AGND	73	IOVCC	103	IOVCC	133	SVSS
14	PBCTLA2	44	AGND	74	GNDRF	104	IOVCC	134	SVSS
15	PBCTLB1	45	AGND	75	VSS	105	GND	135	VCL
16	PBCTLB2	46	C41M	76	VSS	106	GND	136	VCL
17	GVDD	47	C41M	77	TESTE	107	GND	137	VCL
18	GVDD	48	C41M	78	LEDPWM	108	GND	138	VCL
19	VGH	49	C41P	79	EXCK	109	GND	139	VCL
20	VGH	50	C41P	80	FRM	110	AGND	140	AGND
21	C21P	51	C41P	81	LNSW1	111	AGND	141	AGND
22	C21P	52	VCL	82	LNSW0	112	AGND	142	AGND
23	C21P	53	VCL	83	LNSW0	113	AGND	143	AGND
24	C21M	54	VCI	84	PNSW	114	AGND	144	AGND
25	C21M	55	VCI	85	IM[2]	115	VCI	145	GND
26	C21M	56	VCI	86	IM[1]	116	VCI	146	GND
27	SVDD	57	VPLVL	87	IM[1]	117	VCI	147	GND
28	SVDD	58	VNLVL	88	IM[0]	118	VCI	148	GND
29	SVDD	59	VCOM	89	VSOUT	119	VCI	149	GND
30	SVDD	60	VCOM	90	HSOUT	120	SVDD	150	VDD

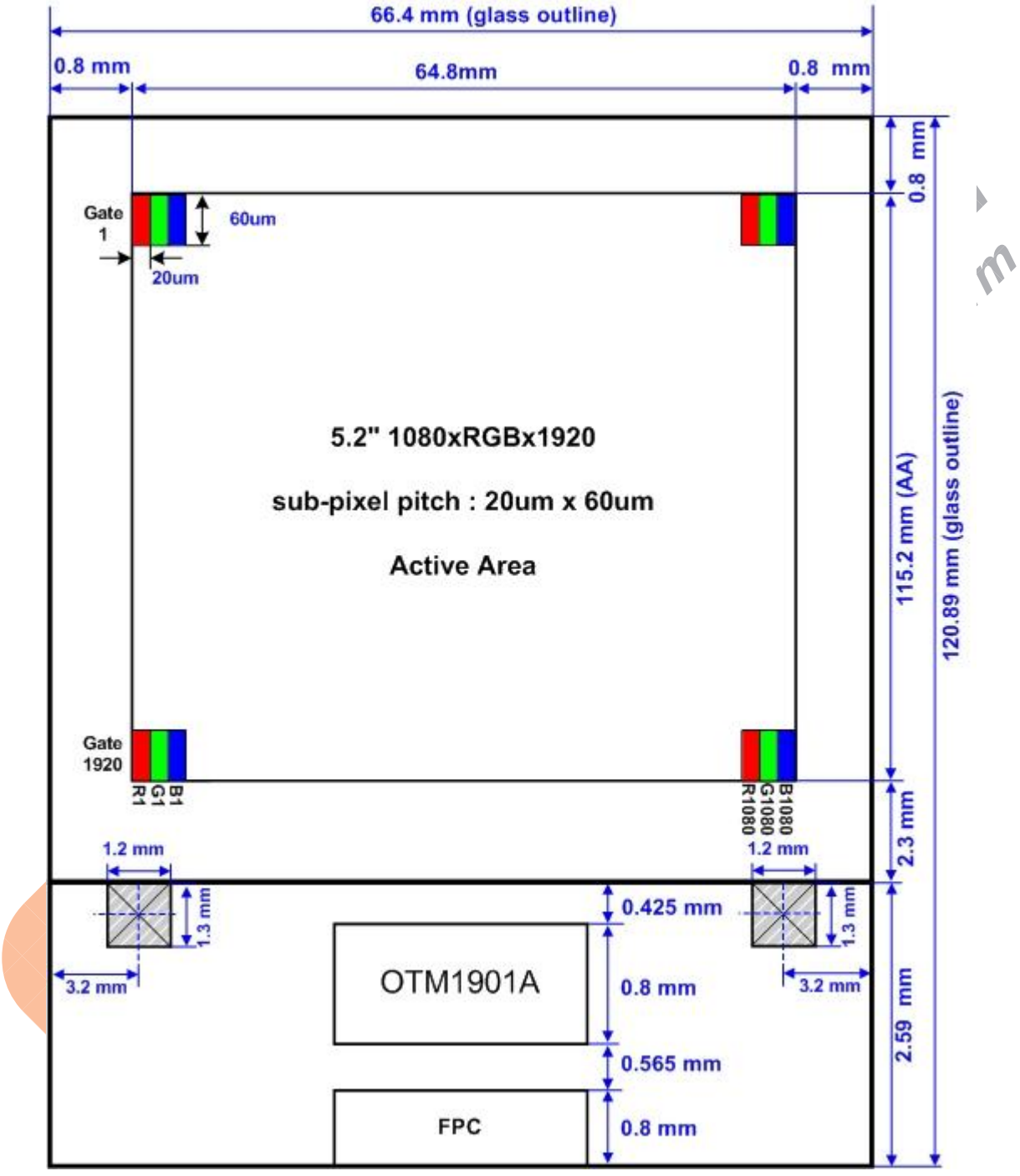
151	VDD	181	VDDLP	211	C31P
152	VDD	182	GND	212	C31P
153	IOVCC	183	GND	213	C31P
154	IOVCC	184	GND	214	C31M
155	IOVCC	185	AVSS	215	C31M
156	GND	186	AVSS	216	C31M
157	GND	187	AVSS	217	VGL
158	DPHYGND	188	DUMMYR1	218	VGL
159	DPHYGND	189	DUMMYR2	219	VGL
160	DPHYGND	190	VCL	220	VGL
161	DATA2P	191	VCL	221	GVSS
162	DATA2N	192	VCL	222	GVSS
163	DPHYGND	193	VCI	223	AVSS
164	DATA1P	194	VCI	224	AVSS
165	DATA1N	195	SVDD	225	GVDD
166	DPHYGND	196	SVDD	226	GVDD
167	CLK_P	197	SVDD	227	GVDD
168	CLK_N	198	VSP	228	AGND
169	DPHYGND	199	VSP	229	AGND
170	DATA0P	200	VSP	230	VCOM
171	DATA0N	201	EXPWRN	231	VCOM
172	DPHYGND	202	VSN	232	ASB
173	DATA3P	203	VSN	233	SB
174	DATA3N	204	VSN	234	VSS
175	DPHYVCC	205	SVSS	235	VSS
176	DPHYVCC	206	SVSS	236	DUMMY
177	DPHYVCC	207	SVSS	237	DUMMY
178	DPHYVCC	208	VSWN		
179	VDDLP	209	VSWN		
180	VDDLP	210	DUMMY		

<Note>

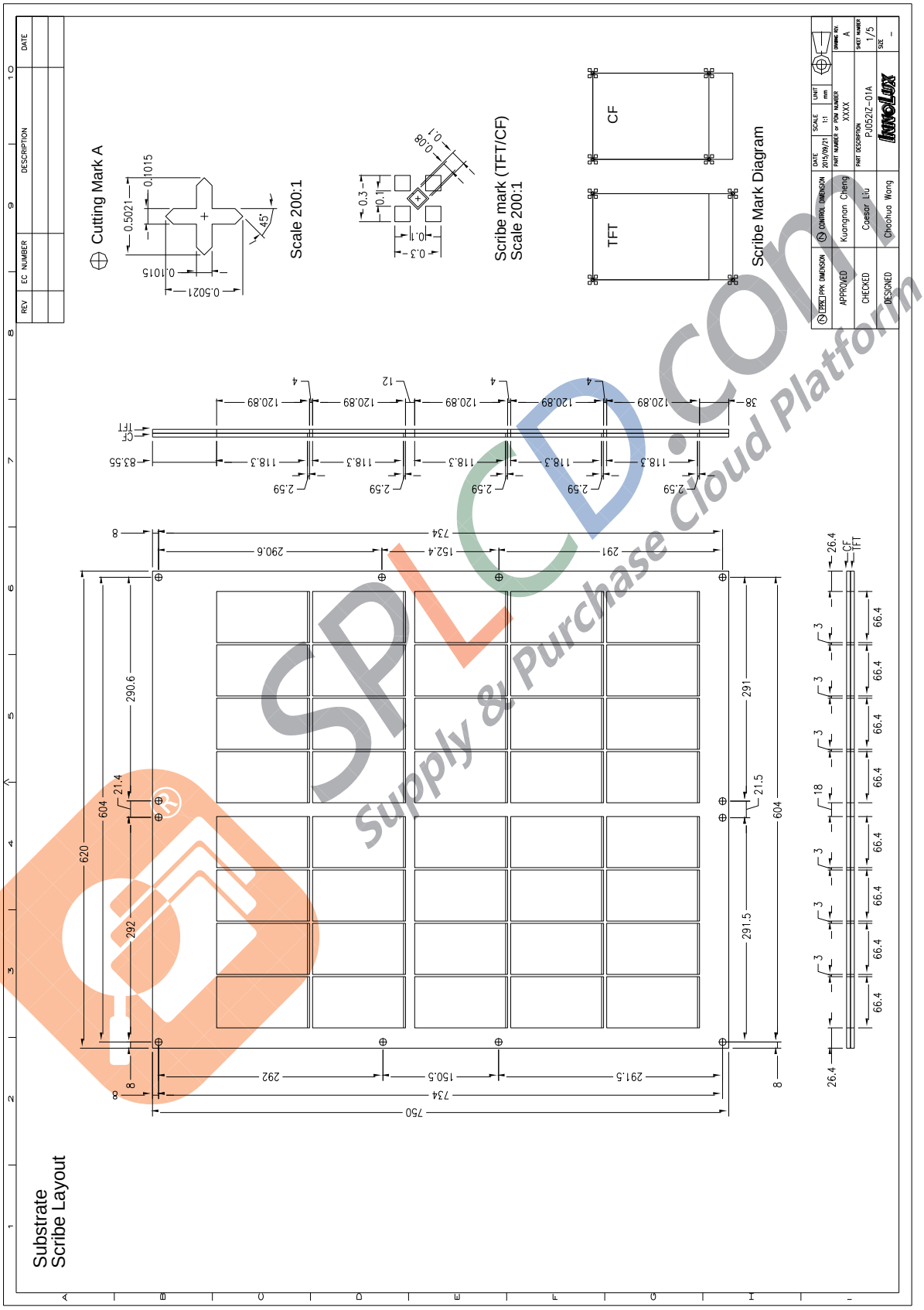
(1) FPC pin No. 3/4/234/235: Please connect these pins to GND on FPCa design.

(2) FPC pin No. 232 (ASB) & No. 233 (SB): Please short these pins with FPC pin No. 9/10/221/222 on FPCa design.

3.2 SCHEMATIC PANEL LAYOUT



4. CELL SCRIBE



5. ELECTRICAL SPECIFICATION

Item	Symbol	Specification			Unit
		Min.	Typ.	Max.	
TFT gate on voltage	VGH	--	9	--	V
TFT gate off voltage	VGL	--	-5.6	--	V
TFT common electrode voltage	Vcom(DC)	--	OTP. (1)	--	V
Control signal Logic 'H'	STVs, CKVs,RESET, BGAS, CKHs		VGH		V
Control signal Logic 'L'	STVs, CKVs, RESET, BGAS, CKHs		VGL		V

Note (1) Vcom must be adjusted to optimize display quality :flicker, contrast ratio and etc.

(2) VGH is TFT gate operating voltage (acceptable variation : ±0.2V)

(3) VGL is TFT gate operating voltage (acceptable variation : ±0.2V)

(4) Environmental condition: 25±5 ˚C

- Frame rate : **60Hz**
- 1 frame time (F) : **16.67 ms**

Video voltage for signals (VIDEO1) and (VIDEO2) must be opposite between frame(N) to frame (N+1)

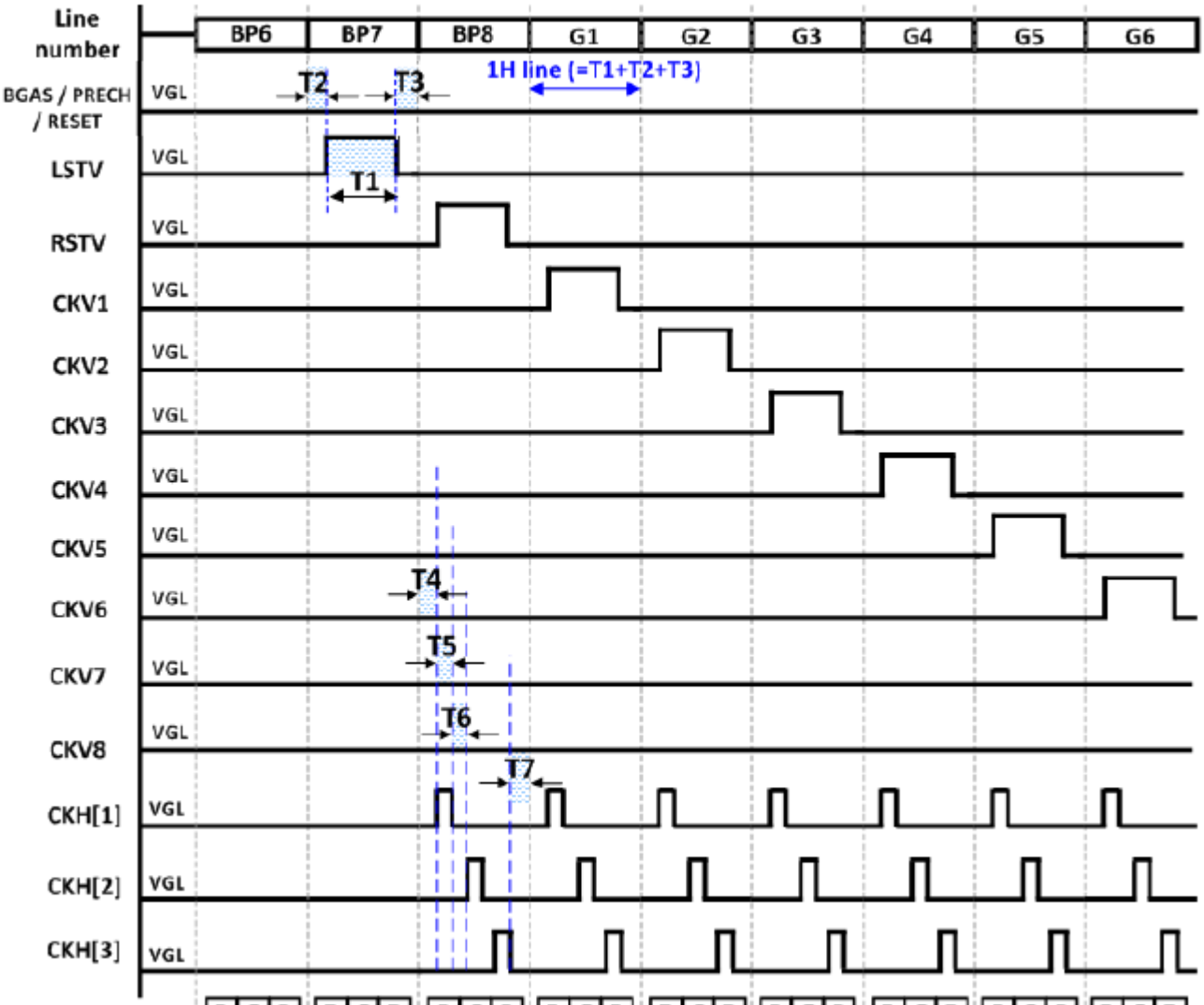
Ex: VIDEO1 for frame (N) colors B, G, R are 0.2, -0.2V, 0.2V respectively, then for frame (N+1) must be -0.2V, 0.2V, -0.2V

Suggest Video value	+Vw	-Vw	+Vg	-Vg	+Vb	-Vb
Voltage	+4.8	-4.8	+2.6	-2.6	+0.2	-0.2

2-1. Timing Recipe

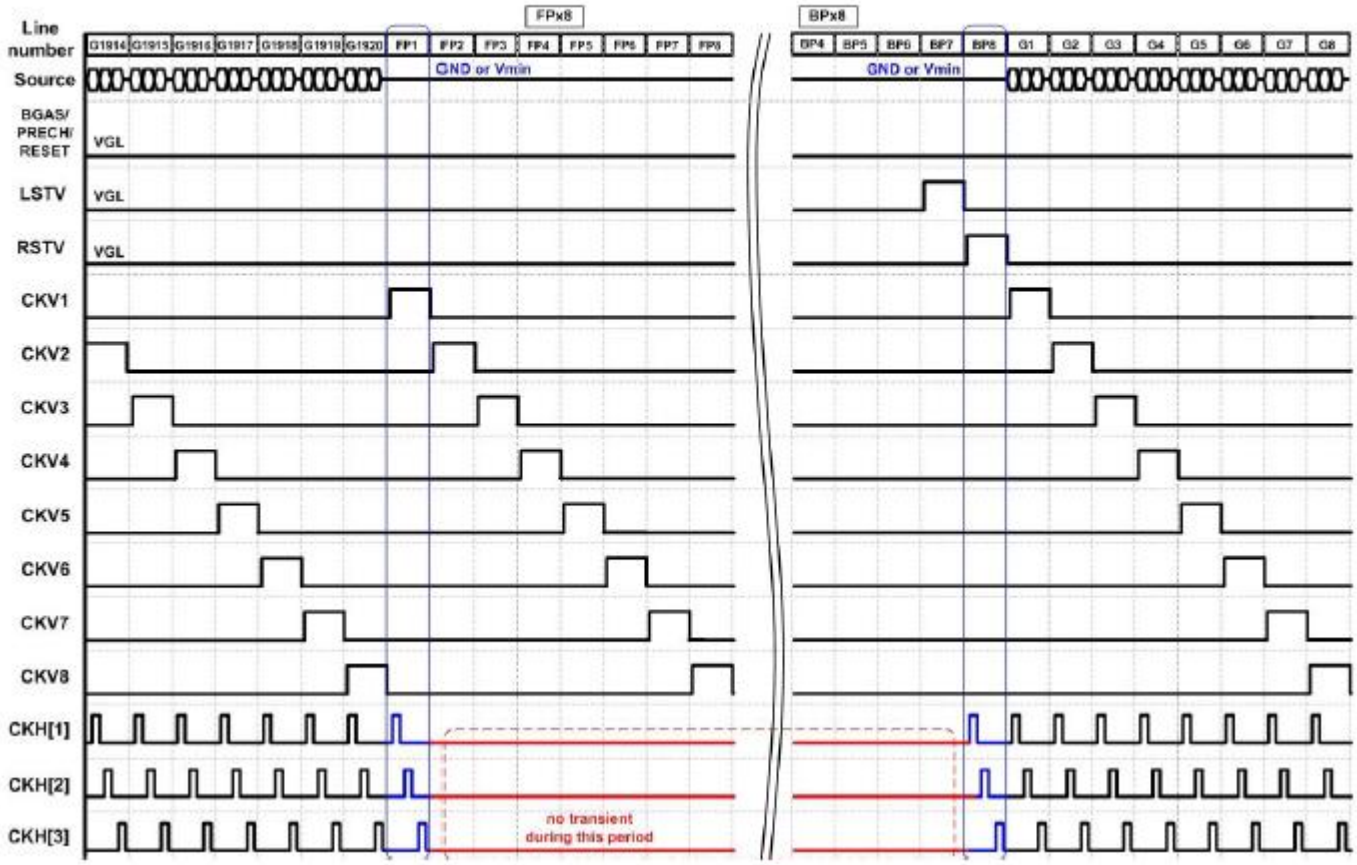
	T1	T2	T3	T4	T5	T6	T7	1H line
Timing (us)	7.35	0	1.25	0	1.9	0.55	1.8	8.6
Freq. (Hz)	60							
Blanking lines	16 (front porch=back porch=8, suggest value)							
Resolution (HxV)	1080 x RGB x 1920							

2-2. Timing Waveforms – forward scan

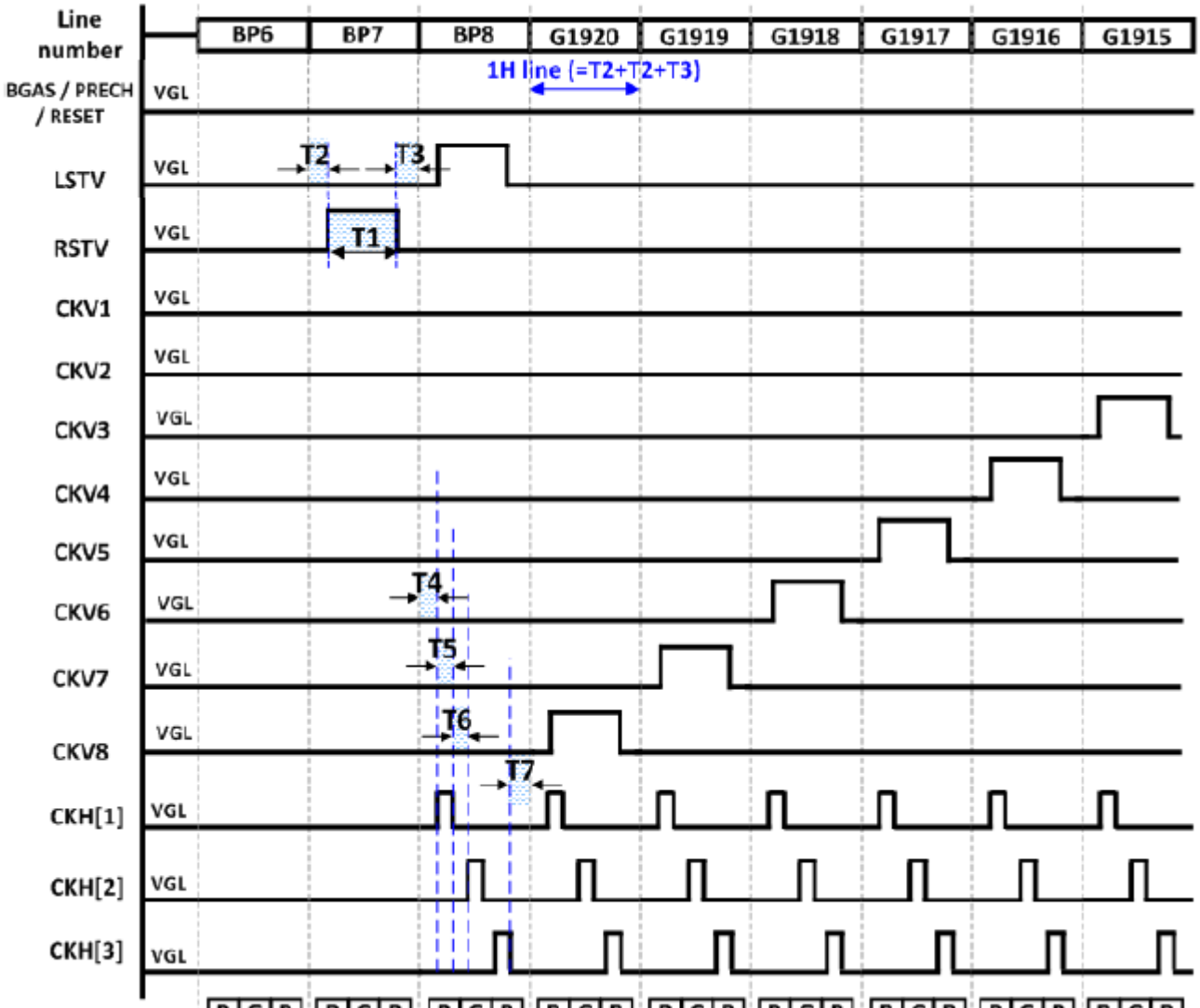


Black Vols (V)	VIDEO1	0	0	0	0	0	0	0	0	0	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb
	VIDEO2	0	0	0	0	0	0	0	0	0	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb
White Vols (V)	VIDEO1	0	0	0	0	0	0	0	0	0	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw
	VIDEO2	0	0	0	0	0	0	0	0	0	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw
Gray Vols (V)	VIDEO1	0	0	0	0	0	0	0	0	0	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg
	VIDEO2	0	0	0	0	0	0	0	0	0	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg
Red Vols (V)	VIDEO1	0	0	0	0	0	0	0	0	0	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb
	VIDEO2	0	0	0	0	0	0	0	0	0	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb
Green Vols (V)	VIDEO1	0	0	0	0	0	0	0	0	0	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb
	VIDEO2	0	0	0	0	0	0	0	0	0	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb
Blue Vols (V)	VIDEO1	0	0	0	0	0	0	0	0	0	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw
	VIDEO2	0	0	0	0	0	0	0	0	0	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw

2-3. Two Frame Timing – forward scan

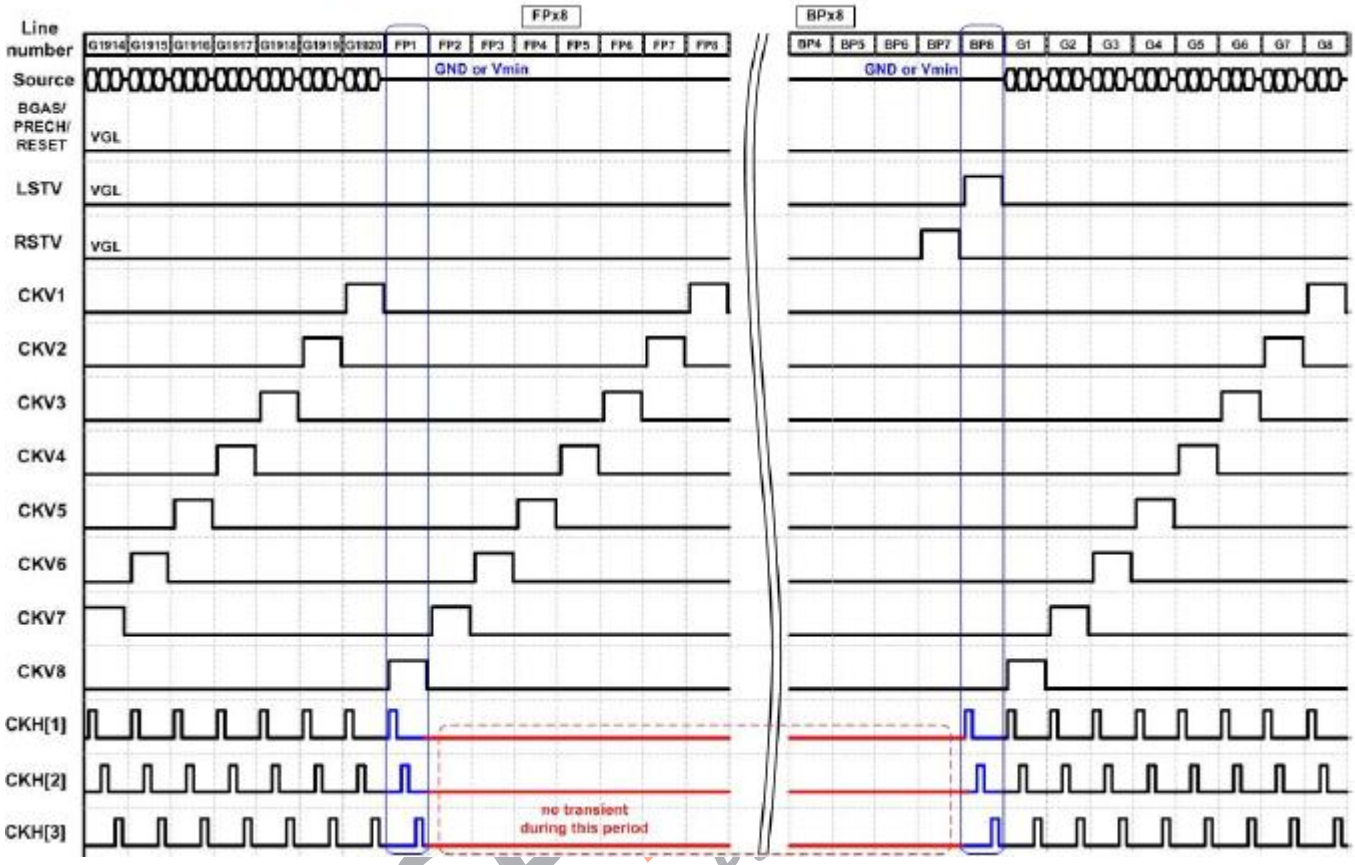


2-4. Timing Waveforms – backward scan



Black Vols (V)	VIDEO1	0	0	0	0	0	0	0	0	0	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb	+Vb
	VIDEO2	0	0	0	0	0	0	0	0	0	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb	-Vb
White Vols (V)	VIDEO1	0	0	0	0	0	0	0	0	0	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw	+Vw
	VIDEO2	0	0	0	0	0	0	0	0	0	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw	-Vw
Gray Vols (V)	VIDEO1	0	0	0	0	0	0	0	0	0	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg	+Vg
	VIDEO2	0	0	0	0	0	0	0	0	0	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg	-Vg
Red Vols (V)	VIDEO1	0	0	0	0	0	0	0	0	0	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb
	VIDEO2	0	0	0	0	0	0	0	0	0	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb
Green Vols (V)	VIDEO1	0	0	0	0	0	0	0	0	0	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb
	VIDEO2	0	0	0	0	0	0	0	0	0	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb
Blue Vols (V)	VIDEO1	0	0	0	0	0	0	0	0	0	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw	+Vb	+Vb	+Vw
	VIDEO2	0	0	0	0	0	0	0	0	0	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw	-Vb	-Vb	-Vw

2-5. Two Frame Timing – backward scan



6. OPTICAL SPECIFICATION

Item		Symbol	Conditions	Specifications			Unit	Note
				Min.	Typ.	Max.		
Transmittance (without APCF) (no WOTP)		T%	Viewing normal angle θX = θY =0°	2.68	3.2		%	1.POL without APCF 2.Light cource : YAG BL rank: AOT 3004C-W3M3 (avg. Bt09&29) 3.Metrology : DMS900 4.wo TOD
Contrast Ratio		CR		700	1000			
Response Time		Ton + Toff			20	25	ms	
Viewing Angle	Hor.	θX+	Center CR>10	--	80	--	deg.	
		θX-		--	80	--		
	Ver.	θY+		--	80	--		
		θY-		--	80	--		
CF only (RGB+OC+ Backside ITO) Color Chromaticity (CIE 1931)	Red	XR	Viewing normal angle θx = θY =0°	0.621	0.651	0.681	--	w/i OC w/i ITO under C-light
		YR		0.288	0.318	0.348	--	
	Green	XG		0.236	0.266	0.296	--	
		YG		0.540	0.570	0.600	--	
	Blue	XB		0.113	0.143	0.173	--	
		YB		0.055	0.085	0.115	--	
	White	XW		0.273	0.303	0.333	--	
		YW		0.299	0.329	0.359	--	
	NTSC	xy		58.80	68.80	--	--	

*Note(1) Definition of Contrast Ratio (CR):

The contrast ratio can be calculated by the following expression.

Contrast Ratio (CR) = L255 / L0

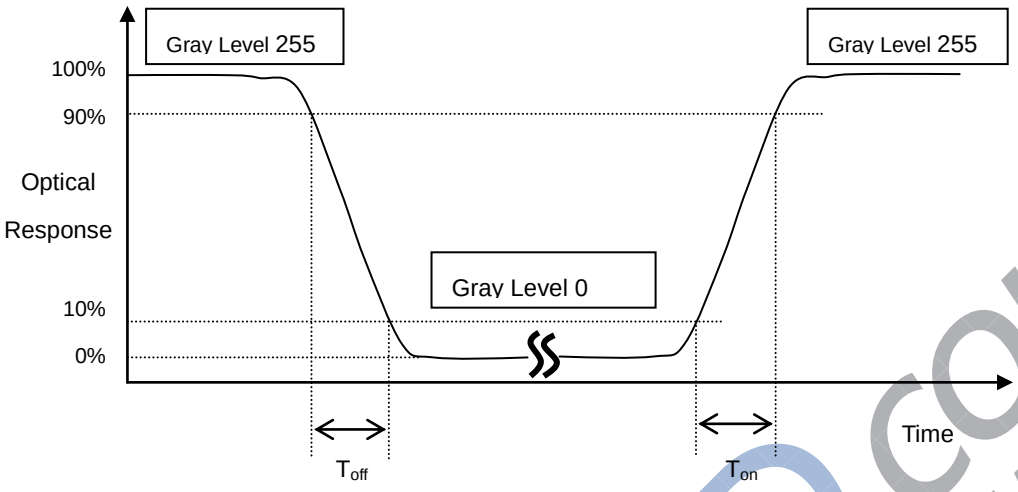
L255 : Luminance of gray level 255

L 0: Luminance of gray level 0

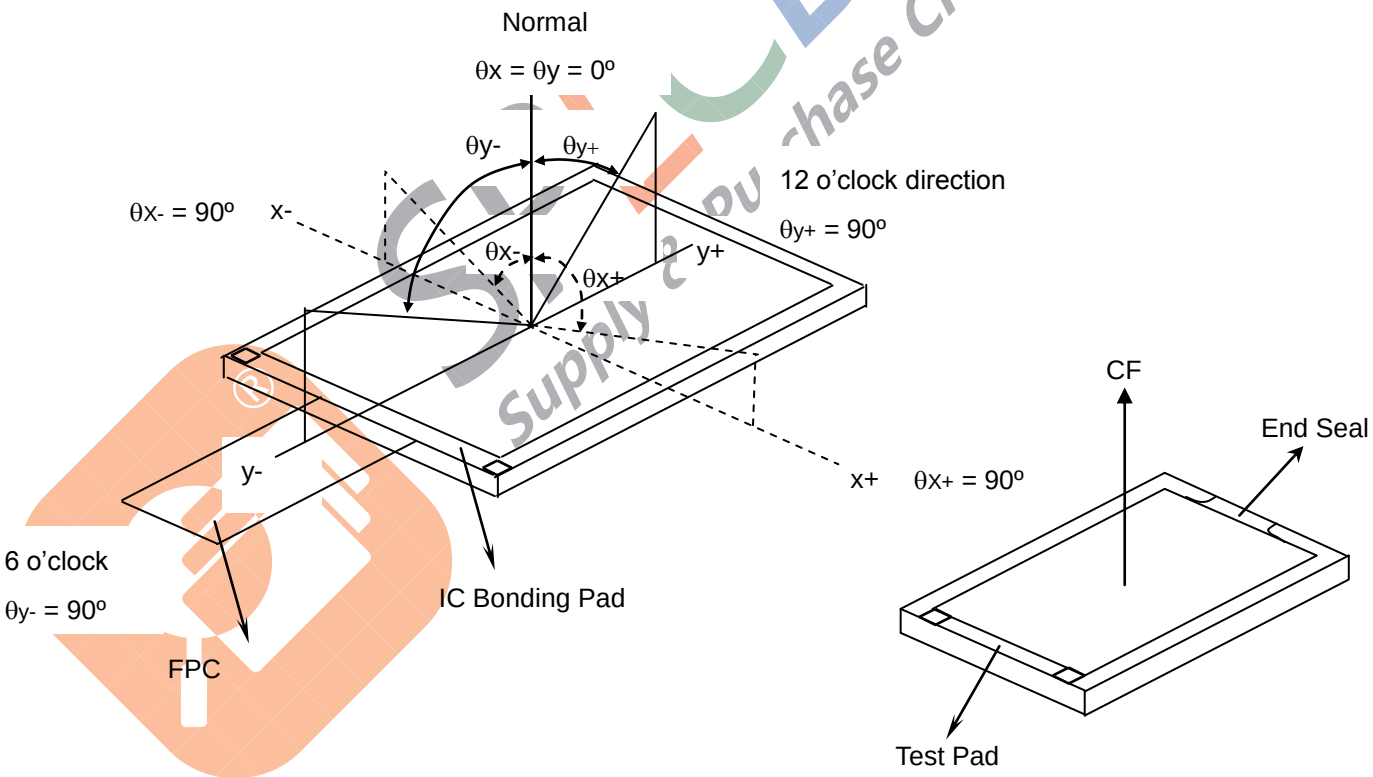
CR = CR (5)

CR (X) is corresponding to the Contrast Ratio of the point X at Figure in Note (5).

*Note (2) Definition of Response Time (T_{on}, T_{off}):

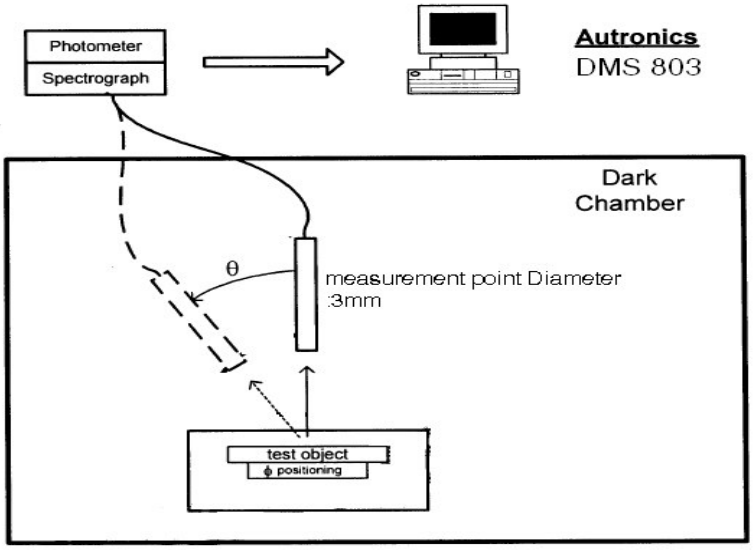


*Note(3) Definition of Viewing Angle

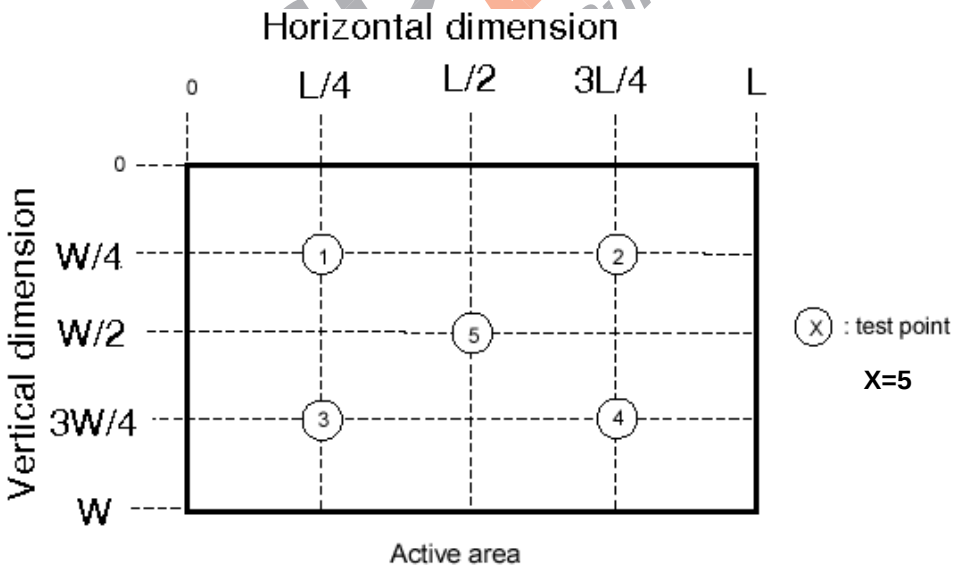


*Note (4) Measurement Set-Up:

The LCD module should be stabilized at a given temperature for 20 minutes to avoid abrupt temperature change during measuring. In order to stabilize the luminance, the measurement should be executed after lighting Backlight for 20 minutes in a windless room.



*Note (5)



7. RELIABILITY SPECIFICATION

No.	Test Item	Test Condition	Check Time
1	High Temp Storage	Ta= 80℃	240 hrs
2	Low Temp Storage	Ta= -30℃	240 hrs
3	High Temp Operation	Ta= 70℃	240 hrs
4	Low Temp Operation	Ta= -20℃	240 hrs
5	High Temp & High Humidity Operation	Ta=60℃ H=90%RH	240 hrs

Note: (1) Ta : Ambient temperature

(2) All judgments of display are performed after temp of panel returns to room temperature

(3) Display function should be no change under normal operating condition.

(4) Under no condensation of dew

8. PACKAGE FORM

8.1 PACKAGE