Chunghwa Picture Tubes, Ltd.
Product Specification

To :
Date :

TFT LCD

CLAG050LM12 AX (OTM8108B / ILI9806E)

ACCEPTED BY : (V0.0)

Tentative

APPROVED BY	CHECKED BY	PREPARED BY

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REVISION STATUS

Revision Notice	Description	Page	Rev. Date
0.0	First revision (Tentative)	--	2014/04/29

CONTENTS

1. OVERVIEW

CPT CLAG050LM12 AX is a cell product of 5.0" color TFT-LCD (Thin Film Transistor Liquid Crystal Display), which is for the high end mobile phone application.

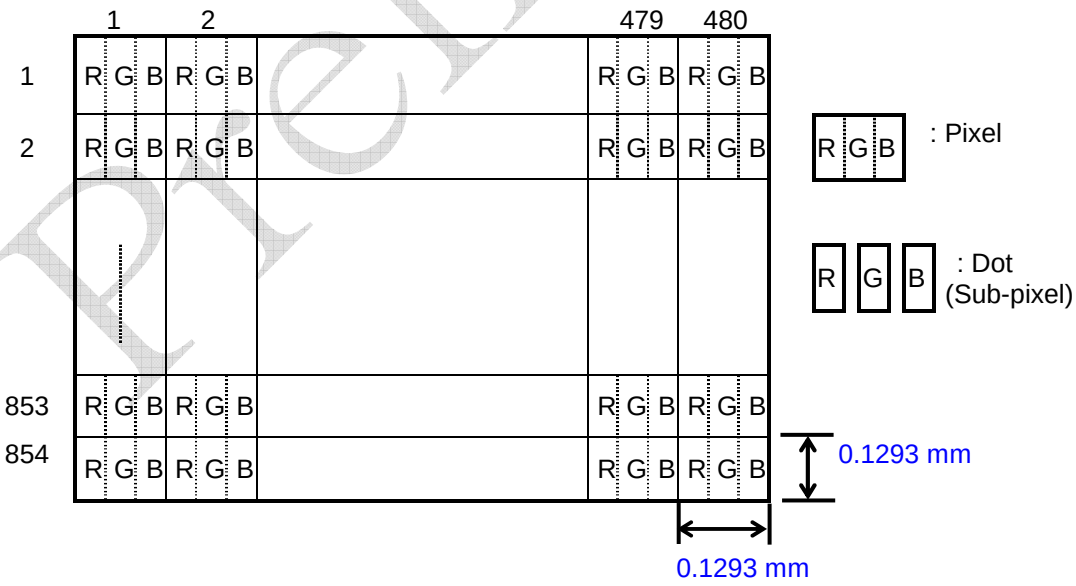
The 5.0” screen produces a high resolution image that is composed of 409,920 (480 X 854) pixel elements in a stripe arrangement.

General specifications are summarized in the following table:

ITEM	SPECIFICATION
Panel Size	5 inch
Display Area (mm)	62.064(W) × 110.4222(H)
CF glass dimension	64.5 (W) x 114.58 (H) x 0.4 (Thickness)
TFT glass dimension	64.5 (W) x 118.1 (H) x 0.4 (Thickness)
Number of Pixels	480 (W) x 3 x 854 (H)
Pixel Pitch (mm)	0.1293 (W) x 0.1293 (H)
Color Pixel Arrangement	RGB Stripe
NTSC	60 % (TYP)
Display Mode	Normally White TN
Driving Method	TFT active matrix
Viewing Direction	65/55/70/70 (U/D/L/R)
Suggesting IC	OTM8018B / ILI9806E
Weight	TBD

Note: The FPC circuit design is possibly different according to the individual suggesting IC internal circuit definition and application. Please refer to the IC datasheet respectively.

LCD Cell Drawing
(Note 1)



The LCD products listed on this document are not suitable for use of aerospace equipment, submarine cables, nuclear reactor control system and life support systems. If customers intend to use these LCD products for above application or not listed in "Standard" as follows, please contact our sales people in advance.

2. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Typ.	Unit	Remark
Electrical Phase						
Power Supply Voltage for Analog	*VDD*	-0.3	4.4	---	V	
Power Supply Voltage for I/O	*VDDI*	-0.3	4.4	---	V	
TFT Gate High Voltage	*VGH*	11.5	19	15	V	OTM8018B
TFT Gate Low Voltage	*VGL*	-16	-8.5	-10	V	
Common Voltage	*VCOM*	-3.475	-0.3	-0.68	V	
TFT Gate High Voltage	*VGH*	10.5	18	15	V	ILI9806E
TFT Gate Low Voltage	*VGL*	-15.5	-7	-10	V	
Common Voltage	*VCOM*	-4	-0.2	-0.68	V	
Feed-Through Voltage	*△Vp (black)*	---	---	0.68	V	
Enviromental Phase						
Operating Ambient Temperature	T_{OP}	-20	+60	℃		
Operating Ambient Humidity	H_{OP}	10	90	%（RH）		
Storage Temperature	T_{STG}	-30	+80	℃		
Storage Humidity	H_{STG}	10	90	%（RH）		

Note 1. The absolute maximum ratings are the values that must not be exceeded at any time for this product. It is not allowed for any of these ratings to be exceeded. Should a product be used with any of the absolute maximum ratings exceeded, the characteristics of the product may not be recovered, or in an extreme case, the product may be permanently destroyed.

Therefore, when designing a system incorporating the product, make sure that adequate attentions be paid to the variations in the supply voltages, the characteristics of parts that are connected, surges in the input and output lines, and the ambient temperatures.

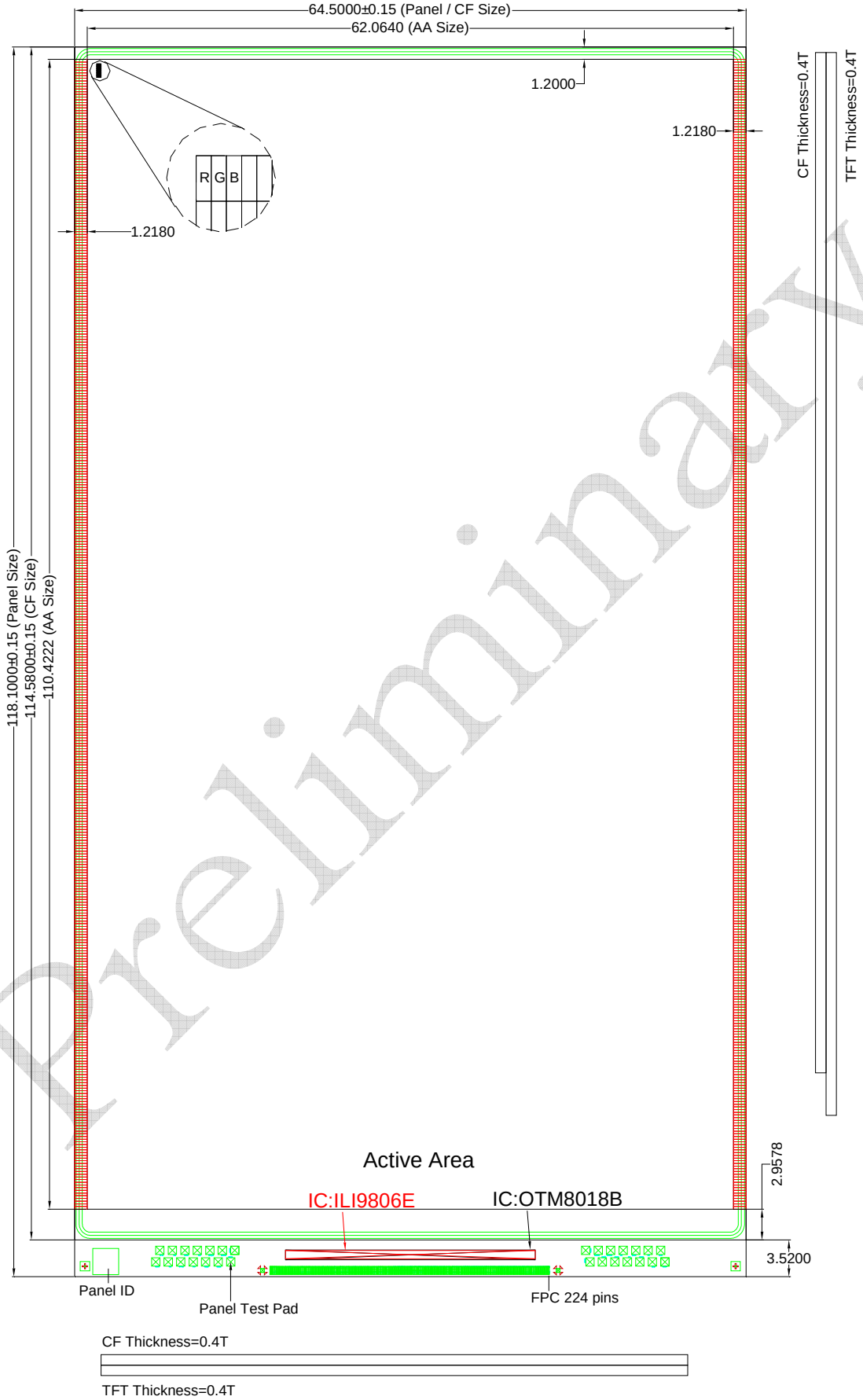
Note 2. This specification applys after the driver IC mounting and the FPC mounting. (This specification isn't applicable at time of driver IC un-mounting and FPC un-mounting.)

LCD should keep the condition that dew dosen't storage in case of driver IC un-mounting and FPC un-mounting. Dew may break the LCD. Especially part is very weak for dew.

3. MECHANICAL SPECIFICATIONS

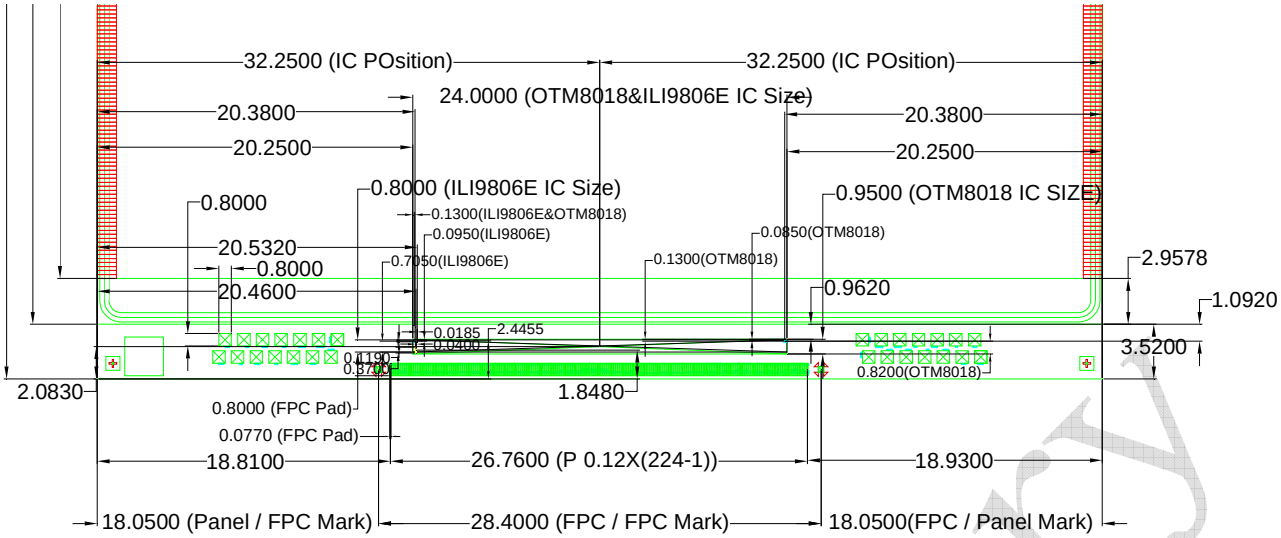
3.1. Outline Dimension

(unit: mm)



3.2. IC & FPC PAD

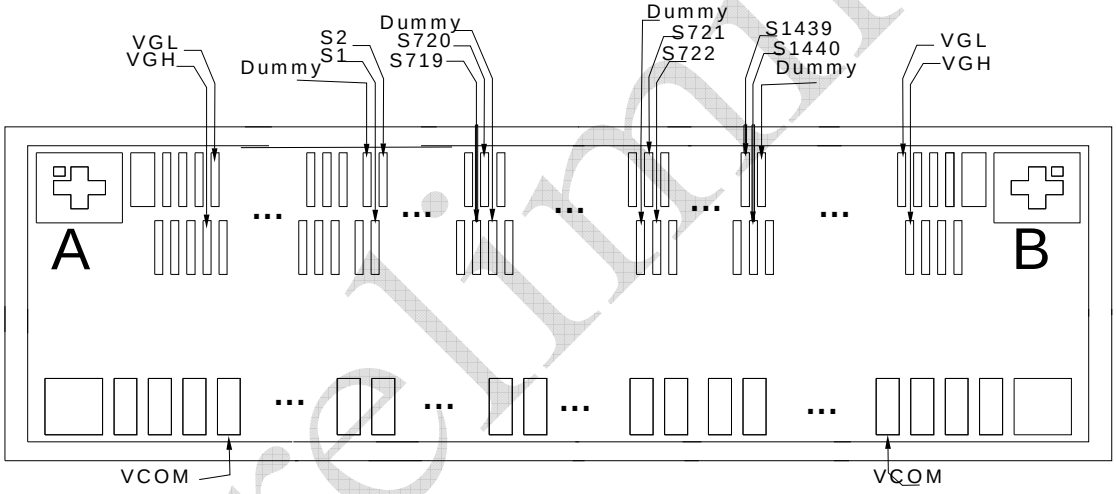
3.2.1. IC PAD



Note1. Color Filter is in the upper side , TFT is in the bottom side
Note2. This IC size is For OTM8018B & ILI9806E

3.2.2. COG Design (DOM)

- IC OTM8018B&ILI9806E

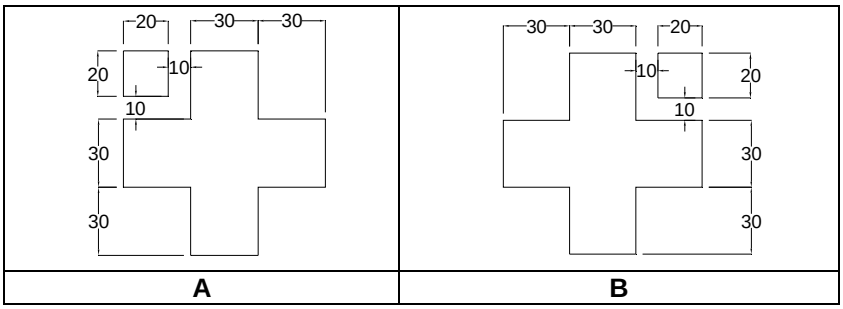


- Chip Size

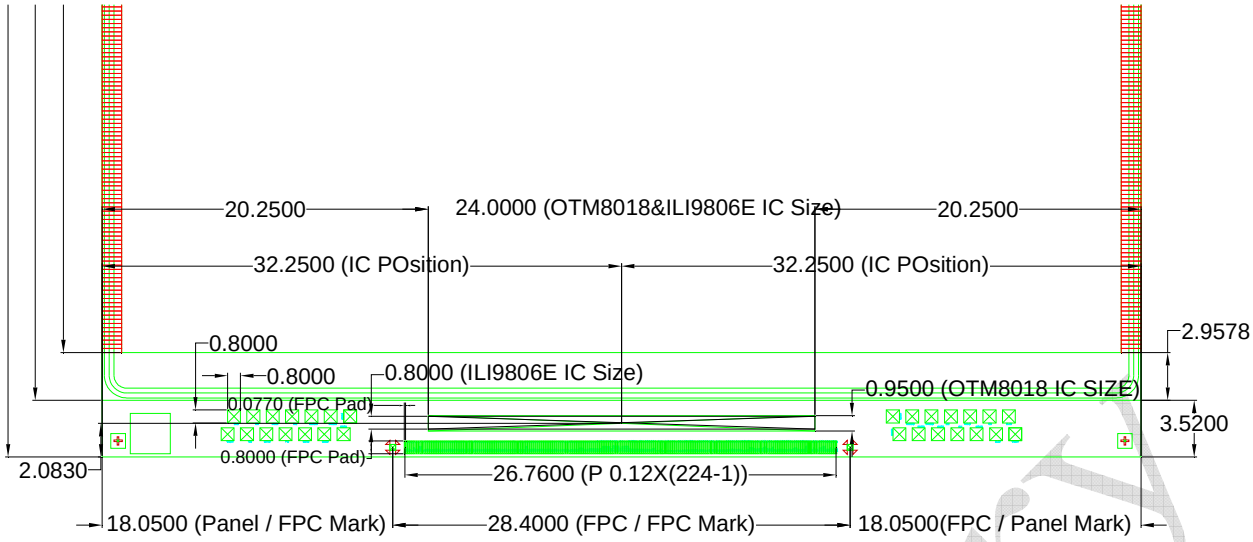
IC	Chip Size
OTM8018B	24mm x 0.95 mm
ILI9806E	24mm x 0.8 mm

- Alignment Mark Size & Position

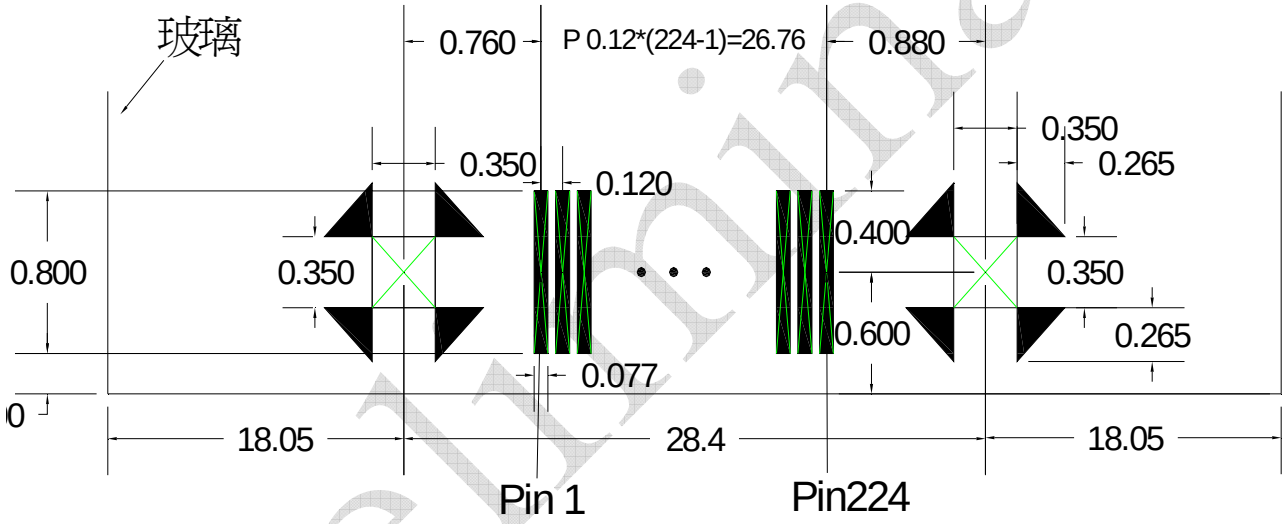
(unit = mm)



FPC PAD



Detail FPC：



3.2.3. FPC Pin Assignment (OTM8108B)

PIN NO.	NAME	PIN NO.	NAME	PIN NO.	NAME	PIN NO.	NAME
1	DUMMY	57	C21N	113	D1_N	169	TE_L
2	DUMMY	58	C21P	114	D1_N	170	EXB1T
3	VCOM	59	C21P	115	D1_P	171	GPO0
4	VGL	60	NVDDA	116	D1_P	172	GPO1
5	VSS	61	NVDDA	117	LVDSVSS	173	GPO2
6	VCOM	62	VSSA	118	VDD_18V	174	GPO3
7	VCOM	63	VSS	119	VSS	175	IM0
8	CONTACT2	64	VDDA	120	VCC	176	IM1
9	CONTACT2	65	VDDA	121	NVDDA	177	IM2
10	VGL	66	C14N	122	NVDDA	178	IM3
11	VGL	67	C14N	123	VSSA	179	I2C_SA0
12	VGL	68	C14P	124	VDDA	180	RGBBP
13	VGL	69	C14P	125	VDDA	181	VGSW0
14	VGL_REG	70	C13N	126	VSS	182	VGSW1
15	VGL_REG	71	C13N	127	VDDIO	183	VGSW2
16	C51N	72	C13P	128	ERR	184	VGSW3
17	C51N	73	C13P	129	LEDON	185	NBWSEL
18	C51P	74	C12N	130	LEDPWM	186	DSTB_SEL
19	C51P	75	C12N	131	VS	187	VSSI_OPT1
20	VRGH	76	C12P	132	HS	188	PSWAP
21	VGHO	77	C12P	133	PCLK	189	DSWAP
22	VGH	78	C11N	134	DE	190	LANSEL
23	C41N	79	C11N	135	D0	191	VDDIO
24	C41N	80	C11P	136	D1	192	VSSA
25	C41P	81	C11P	137	D2	193	VCL
26	C41P	82	VSS	138	D3	194	VDD
27	VSS	83	VSS	139	D4	195	VDD
28	VDD_18V	84	VDD	140	D5	196	VDD_18V
29	C32N	85	VDD	141	D6	197	VSS
30	C32N	86	CSN	142	D7	198	VGMP
31	C32P	87	EXTN	143	D8	199	VGMN
32	C32P	88	CSP	144	D9	200	VGSP
33	C31N	89	EXTP	145	D10	201	VGSN
34	C31N	90	VRGH_DMY	146	D11	202	DIOPWR
35	C31P	91	VREFCP	147	D12	203	VDD
36	C31P	92	VREFCP	148	D13	204	VSS
37	VSS	93	VSS	149	D14	205	VDD
38	VSS	94	TE_R	150	D15	206	VDD
39	VSSA	95	VDD	151	D16	207	VSSA
40	VCL	96	VDDAM	152	D17	208	VREF
41	VCL	97	VDDAM	153	D18	209	VCL
42	VDD	98	LVDSVDD	154	D19	210	VCL

43	VDD	99	LVDSVDD	155	D20	211	VRGH
44	C24N	100	VDDP	156	D21	212	VGL_REG1
45	C24N	101	VDDP	157	D22	213	VGL
46	C24P	102	LVDSVSS	158	D23	214	VGL
47	C24P	103	D0_N	159	VDDIO	215	MTP_PWR
48	C23N	104	D0_N	160	VSS	216	MTP_PWR
49	C23N	105	D0_P	161	RESX	217	CONTACT1
50	C23P	106	D0_P	162	CSX	218	CONTACT1
51	C23P	107	LVDSVSS	163	RDX	219	VCOM
52	C22N	108	CLK_N	164	WRX	220	VCOM
53	C22N	109	CLK_N	165	DCX	221	VSS
54	C22P	110	CLK_P	166	SDI	222	VCOM
55	C22P	111	CLK_P	167	SDO	223	DUMMY
56	C21N	112	LVDSVSS	168	VSEL	224	DUMMY

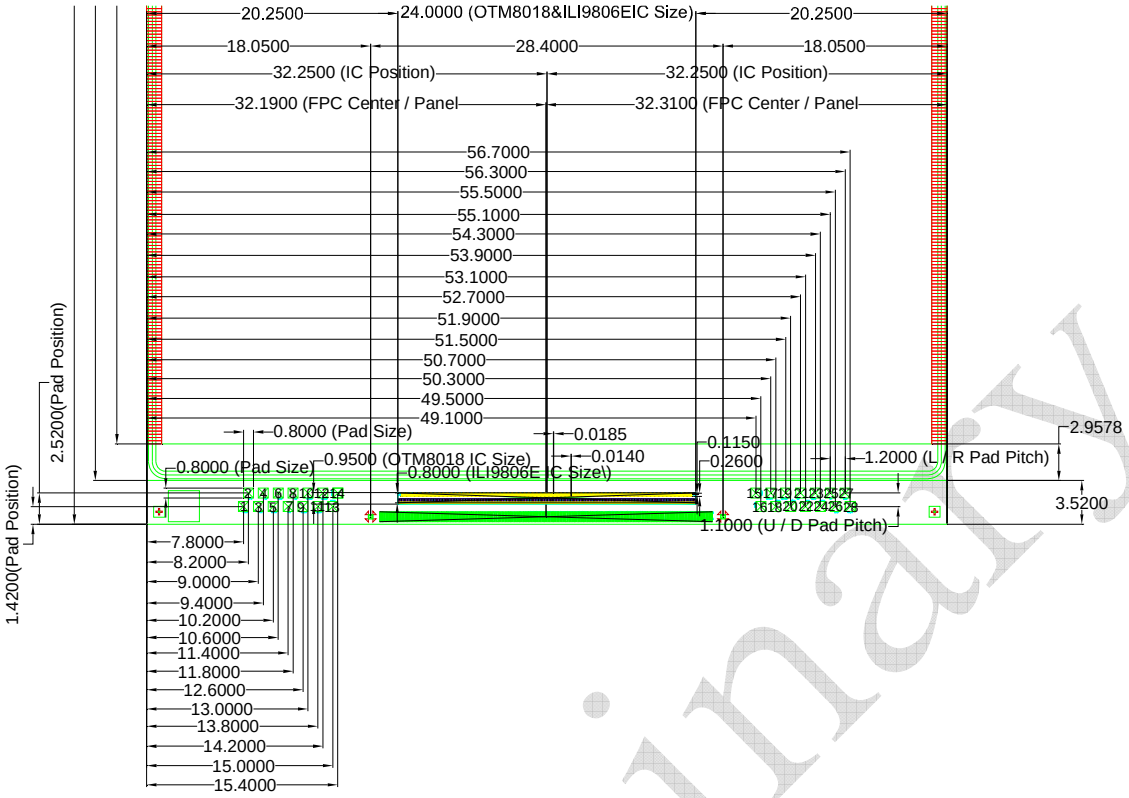
FPC Pin Assignment (ILI9806E)

PIN NO.	NAME	PIN NO.	NAME	PIN NO.	NAME	PIN NO.	NAME
1	DUMMY	57	C21N	113	HS_D1N	169	TE_L
2	DUMMY	58	C21P	114	HS_D1N	170	EXB1T
3	VCOM	59	C21P	115	HS_D1P	171	GPO0
4	VGL	60	DDVDL	116	HS_D1P	172	GPO1
5	DMY_VSS	61	DDVDL	117	DGND	173	GPO2
6	VCOM	62	CGND	118	VDD	174	GPO3
7	VCOM	63	CGND	119	GND	175	IM0
8	CONTACT2B	64	DDVDH	120	VDDA	176	IM1
9	CONTACT2A	65	DDVDH	121	AVEE	177	IM2
10	VGL	66	C14N	122	AVEE	178	IM3
11	VGL	67	C14N	123	AVSS	179	I2C_SA0
12	VGLO	68	C14P	124	AVDD	180	RGBBP
13	VGLO	69	C14P	125	AVDD	181	VGSW0
14	VGL_REG	70	C13N	126	GND	182	VGSW1
15	VGL_REG	71	C13N	127	VDDI	183	VGSW2
16	C51N	72	C13P	128	ERR	184	VGSW3
17	C51N	73	C13P	129	LEDON	185	NBWSEL
18	C51P	74	C12N	130	LEDPWM	186	DSTB_SEL
19	C51P	75	C12N	131	VS	187	GND
20	VGH_REG	76	C12P	132	HS	188	PSWAP
21	VGHO	77	C12P	133	PCLK	189	DSWAP
22	VGH	78	C11N	134	DE	190	LANSEL
23	C41N	79	C11N	135	DB[0]	191	VDDI
24	C41N	80	C11P	136	DB[1]	192	AVSS
25	C41P	81	C11P	137	DB[2]	193	VCL
26	C41P	82	CGND	138	DB[3]	194	VCIP
27	AGND	83	CGND	139	DB[4]	195	VCIP
28	VCORE	84	VCIP	140	DB[5]	196	VDD
29	C32N	85	VCIP	141	DB[6]	197	DVSS
30	C32N	86	DMY	142	DB[7]	198	VGMP_PAD
31	C32P	87	EXTN	143	DB[8]	199	VGMN_PAD
32	C32P	88	DMY	144	DB[9]	200	VGSP_PAD
33	C31N	89	EXTP	145	DB[10]	201	VGSN_PAD
34	C31N	90	VGH_REG	146	DB[11]	202	DIOPWR
35	C31P	91	DMY	147	DB[12]	203	VCI
36	C31P	92	DMY	148	DB[13]	204	VSSR
37	CGND	93	VSSR[2]	149	DB[14]	205	VCI
38	CGND	94	TE_R	150	DB[15]	206	VDDA
39	VSSR[3]	95	VCI	151	DB[16]	207	VSSA
40	VCL	96	VCI	152	DB[17]	208	VREF_PWR
41	VCL	97	VCI	153	DB[18]	209	VCL
42	VCIP	98	VCORE_MIPI	154	DB[19]	210	VCL

43	VCIP	99	VCORE_MIPI	155	DB[20]	211	VRGH
44	C24N	100	V12_MIPI	156	DB[21]	212	VGL_REG
45	C24N	101	V12_MIPI	157	DB[22]	213	VGLO
46	C24P	102	DGND	158	DB[23]	214	VGL
47	C24P	103	HS_D0N	159	VDDI	215	VPP
48	C23N	104	HS_D0N	160	GND	216	VPP
49	C23N	105	HS_D0P	161	RESX	217	CONTACT1B
50	C23P	106	HS_D0P	162	CSX	218	CONTACT1A
51	C23P	107	DGND	163	RDX	219	VCOM_L
52	C22N	108	HS_CN	164	WRX	220	VCOM_L
53	C22N	109	HS_CN	165	DCX	221	VSSIDUM0
54	C22P	110	HS_CP	166	SDI	222	VCOM
55	C22P	111	HS_CP	167	SDO	223	DUMMY
56	C21N	112	DGND	168	VSEL	224	DUMMY

3.3. Panel Check Pad in Panel

(unit = mm)



Panel Check Pad				
Pad Size	800 μm x 800 μm			
Pad Pitch	1100 μm			
Pad Name	01	VCOM	15	G853
	02	D_R	16	RSTO
	03	SW	17	CK2BO
	04	G2	18	CK2O
	05	STVE	19	CK1BO
	06	VGLE	20	CK1O
	07	FW	21	BW
	08	BW	22	FW
	09	CK1E	23	VGLO
	10	CK1BE	24	STVO
	11	CK2E	25	G1
	12	CK2BE	26	D_B
	13	RSTE	27	D_G
	14	G854	28	VCOM

3.3.1. CELL Test Light Waveform

Frame	D_GB	D_RG	D_BR	SW	Vcom
White (W)	L	L	L	H	DC/GND
Black (BK)	H	H	H	H	DC/GND
Gray (GY)	Gray	Gray	Gray	H	DC/GND
Zebra Stripe (Z)	H	H	H	H	DC/GND

Display Mode: TN, Normally White

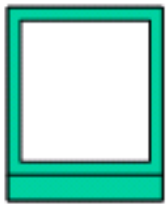
Every Frame stay > 2sec.

Ex. LC=5V, Vcom=0V

Data H=+/-5V, Data L=0V, Data Gray=+/-2.5V

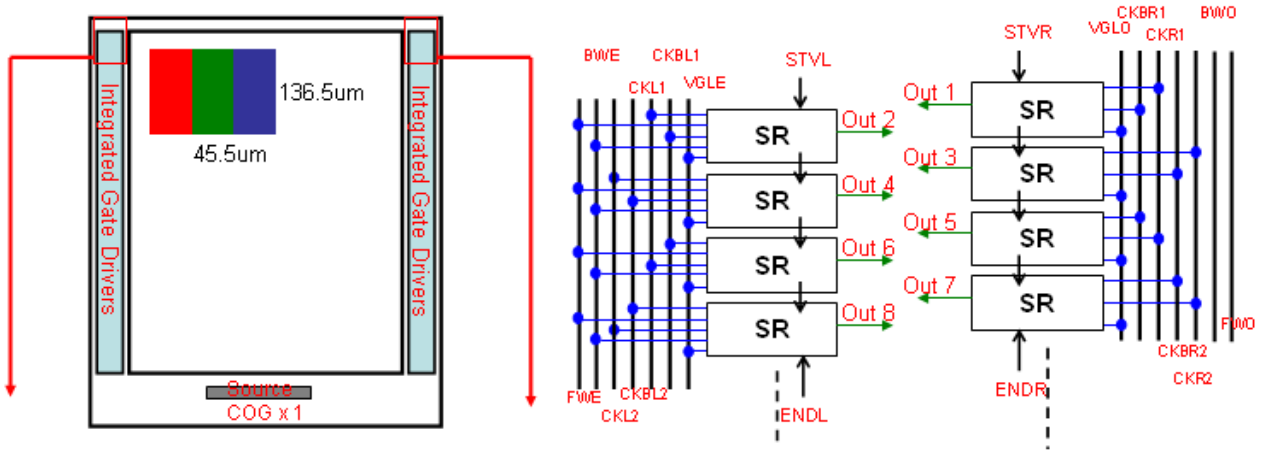
SW_H=10V above (on duty), SW_L=-6V (not on duty)

Just suggestion!



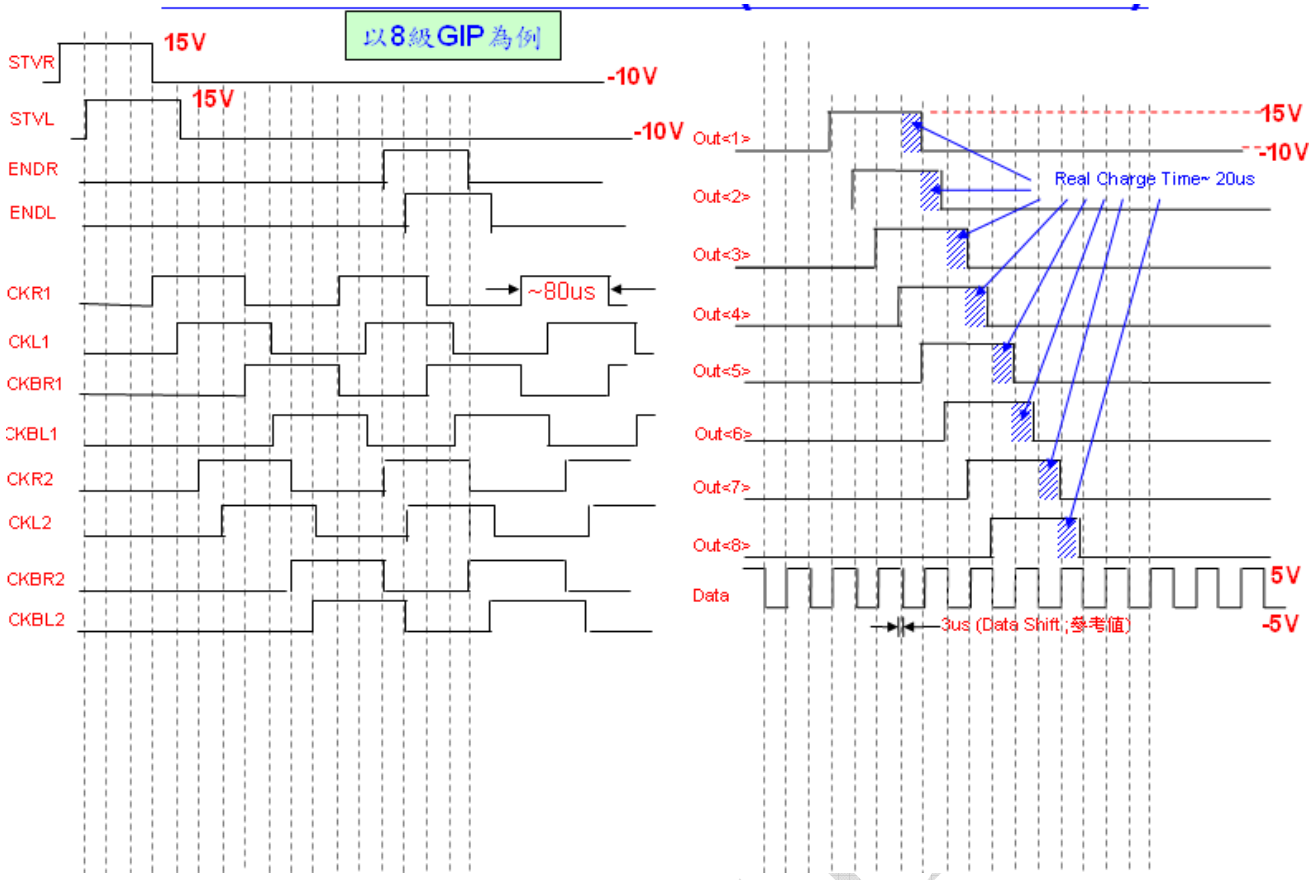
VGLE , VGLO , CKE ,CKBE , CKO ,CKBO ,STVE ,STVO etc. ,
Please follow the TIME CHAR below.

3.3.2. GIP Timing Char

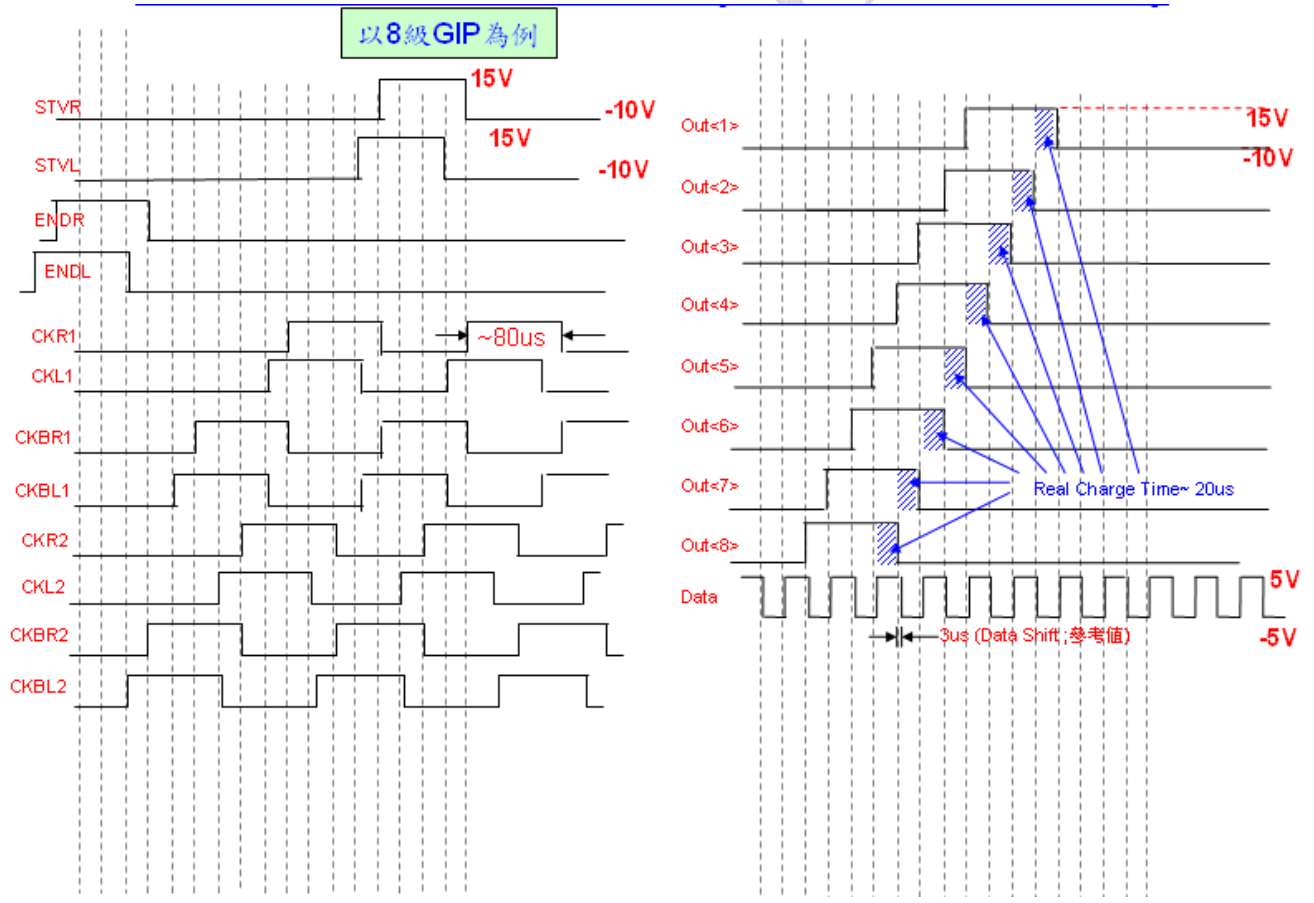


(Forward scan) FWO,FWE=VGH
BWO,BWE=VGL

(Backward scan) FWO,FWE=VGL
BWO,BWE=VGH



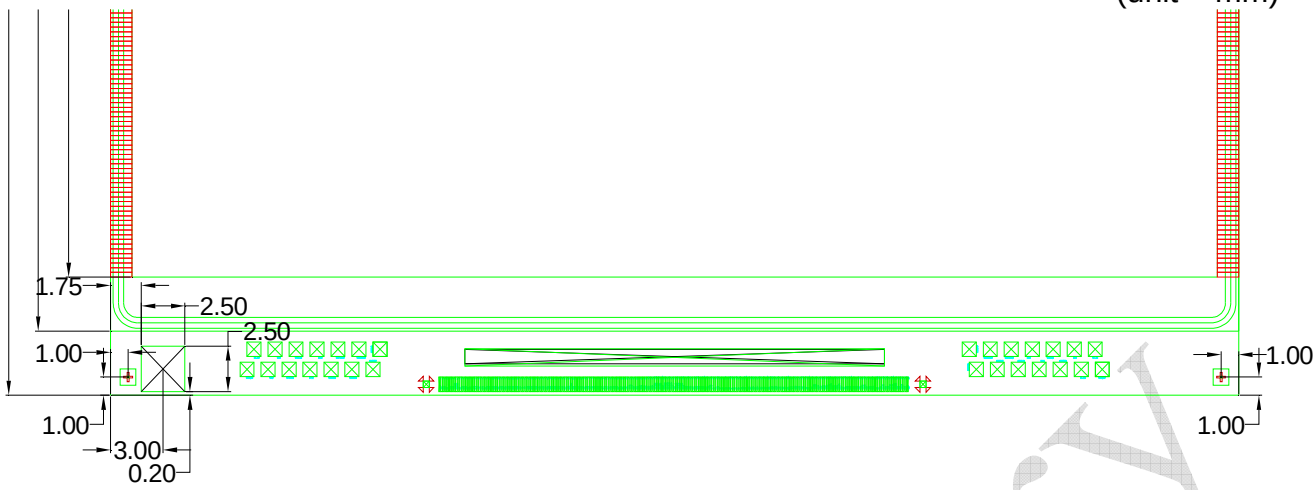
Forward scan



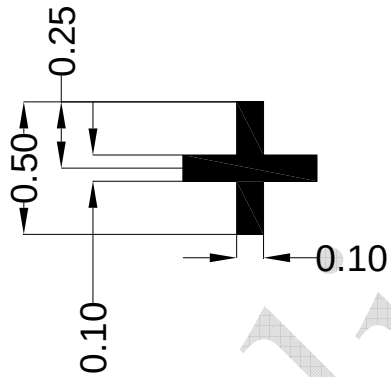
Backward scan

3.4. Panel ID PAD

(unit = mm)

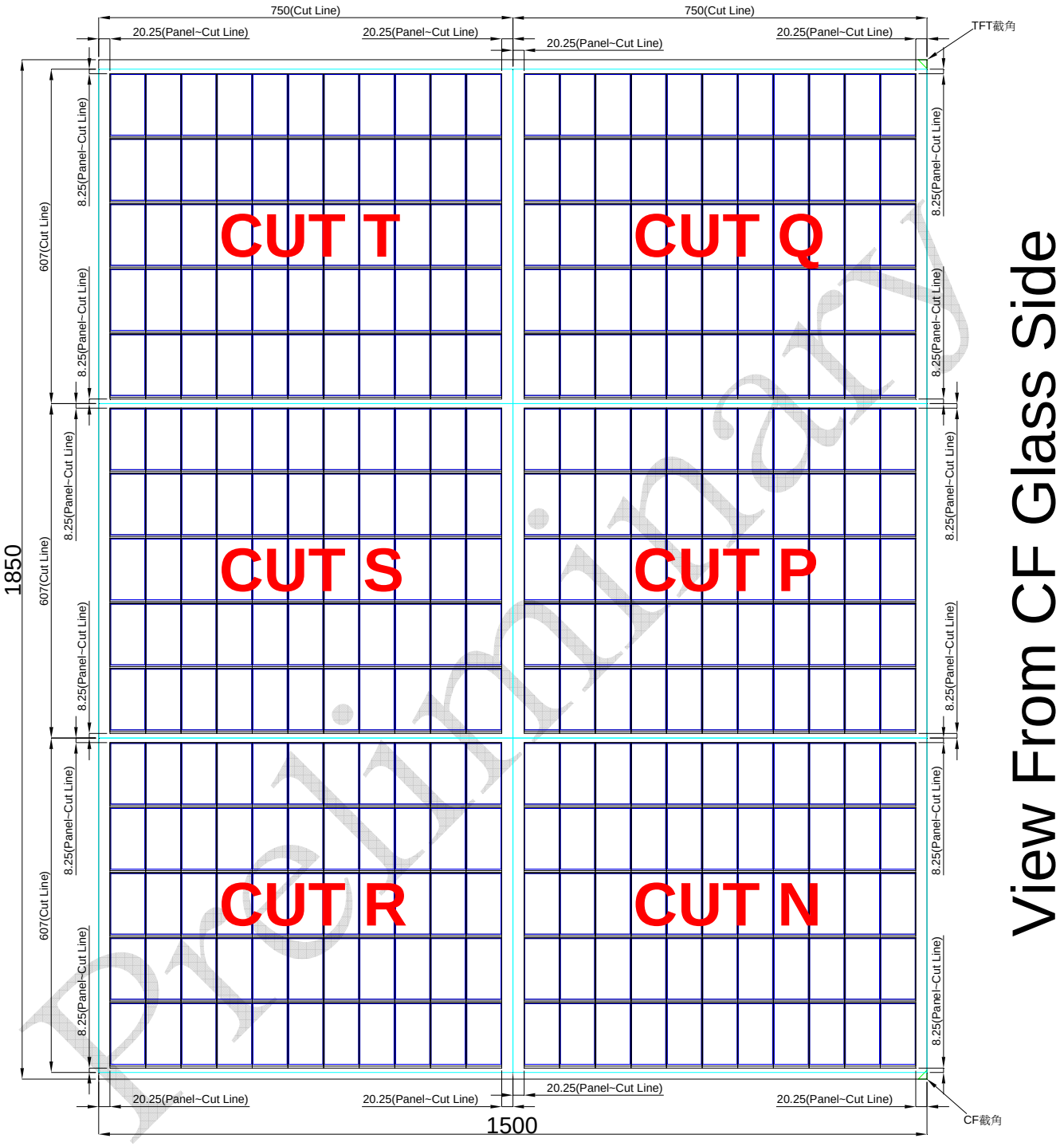


Detail A :

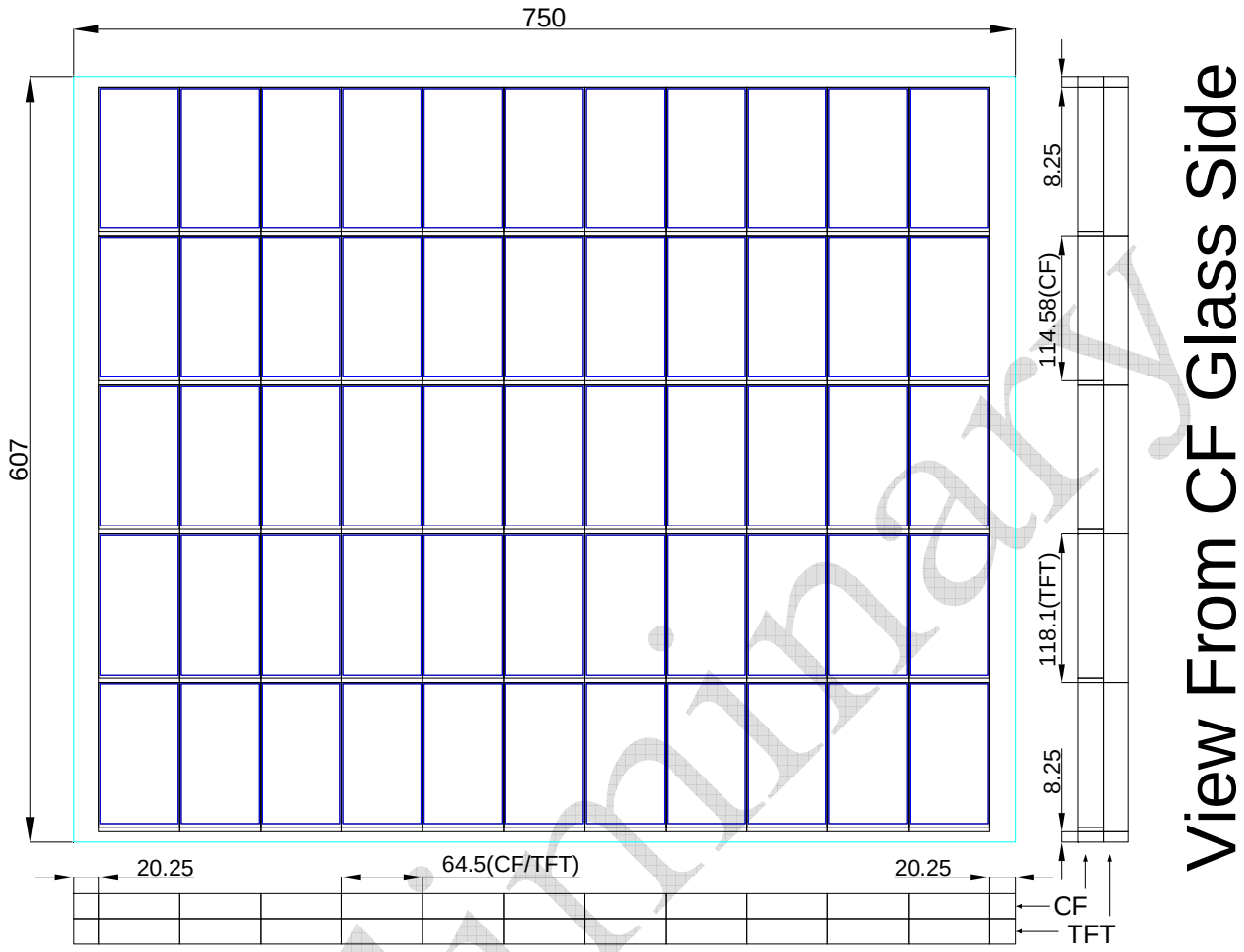


3.5. Cell Scribing Layout (Full cell & 1/6 Cut)

3.5.1. Full Cell 1850 x 1500 (unit=mm)

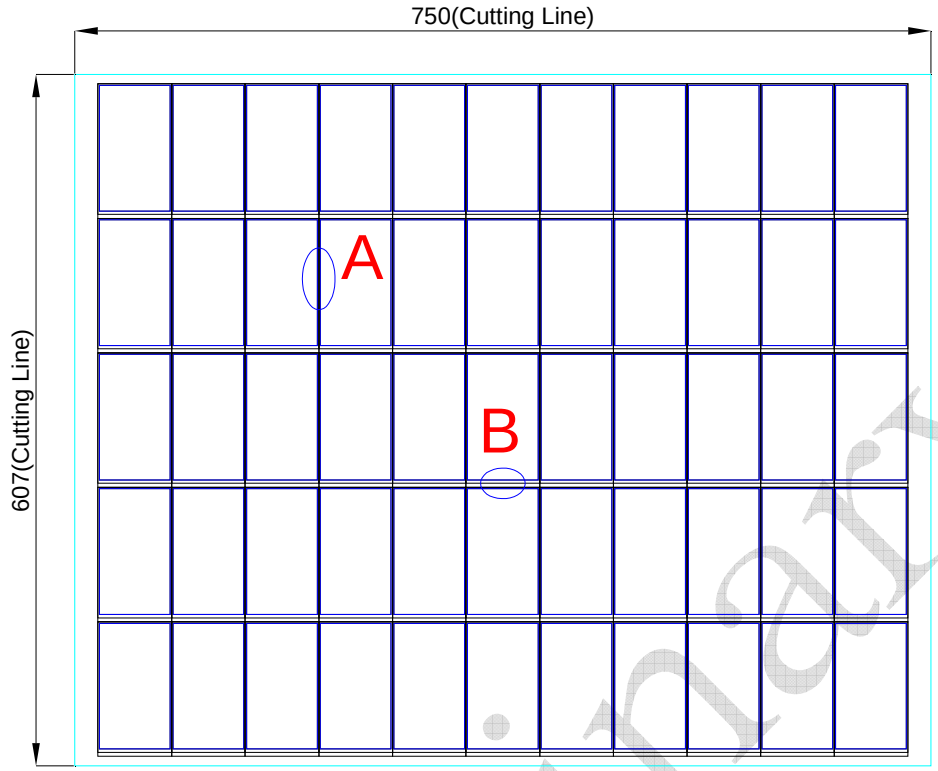


3.5.2. 1/6 Cut 607 x 750 (unit=mm)
(Cut N = Cut P = Cut Q = Cut R = Cut S = Cut T)

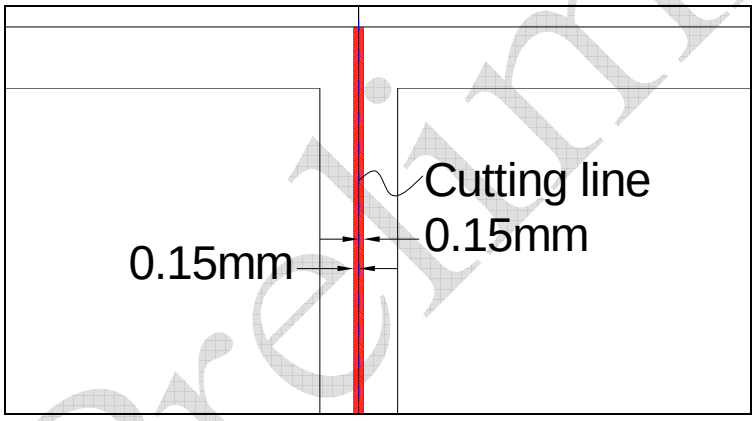


3.5.3. Cut sapce between pcs

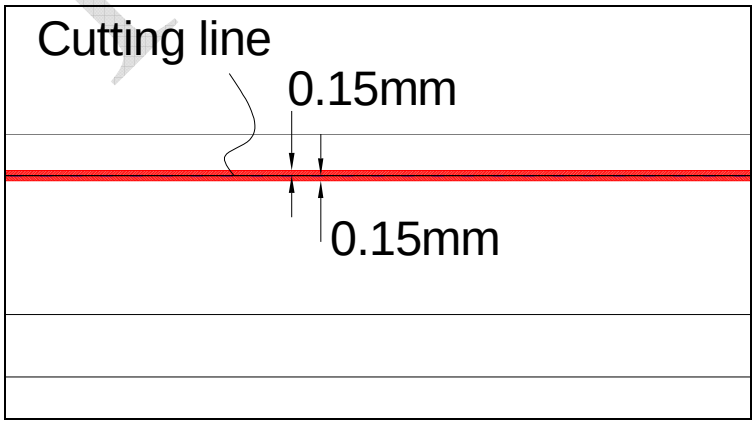
- Margin of Cut space between pcs is 0.15 mm.



Detail A:



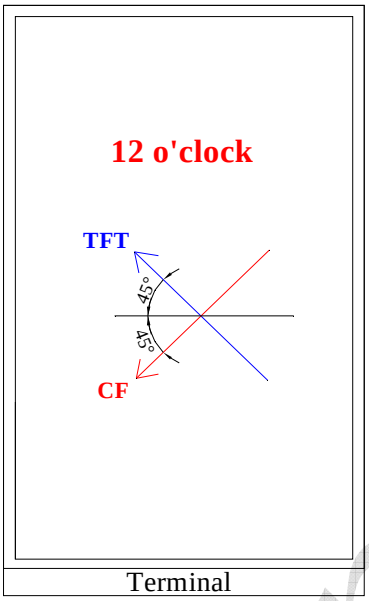
Detail B:



4. CELL PROCESS RULES

Item	Specification
Cell gap	4.1±0.2um
Assembly precision	±4.0um

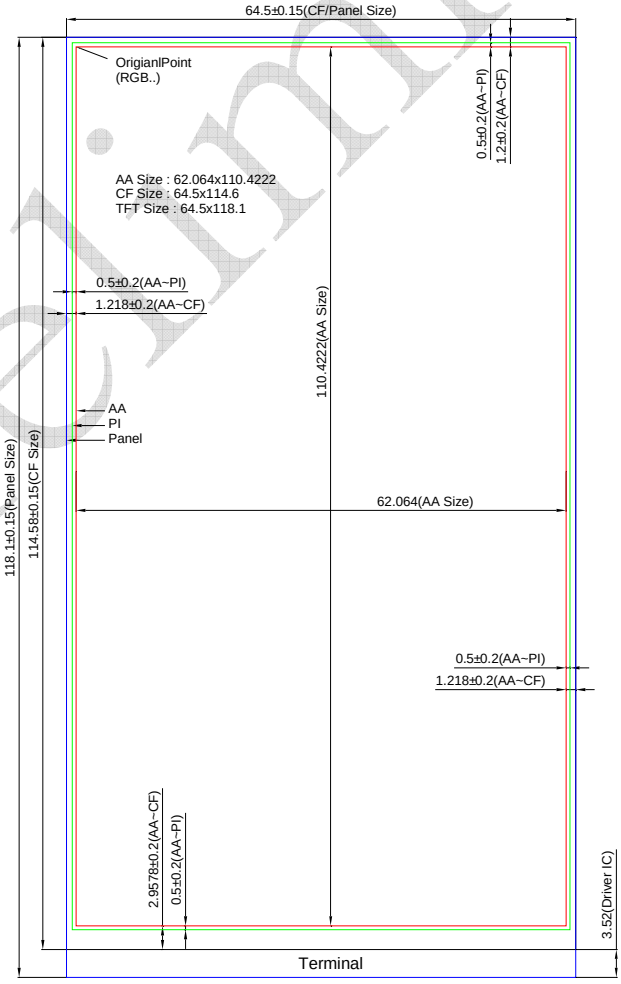
4.1. Rubbing Direction



View From CF Side

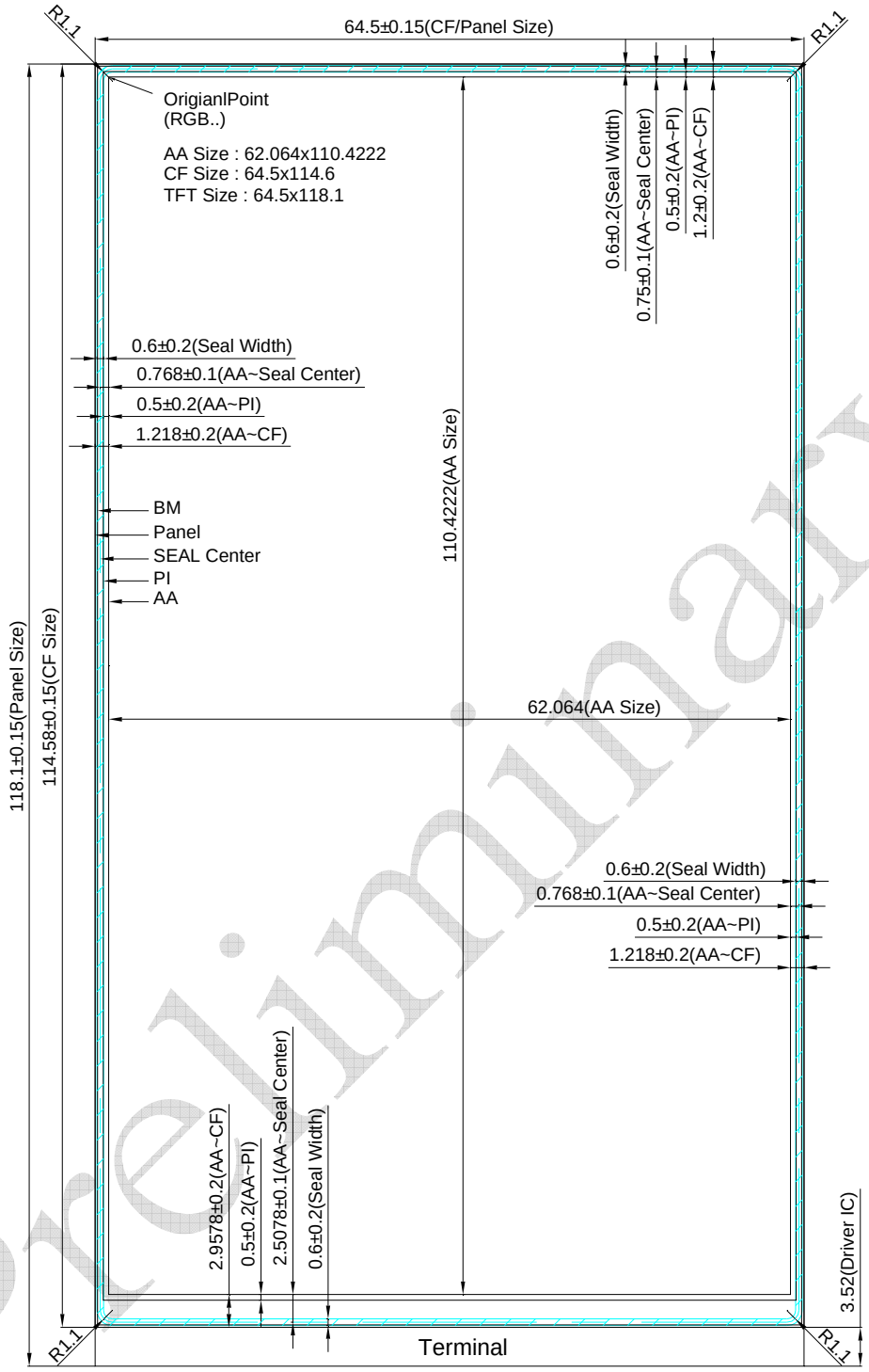
4.2. PI Pattern

(unit = mm)



4.3. Seal Pattern

(unit = mm)



Notes:

1. Seal width (Typ.) = 0.6±0.2 mm
2. With ODF process，Seal junction length = 15 mm (max.) and width = (0.6+0.4) mm
3. Seal Center to CF Edge = 0.45±0.2mm

5. OPTICAL SPECIFICATION

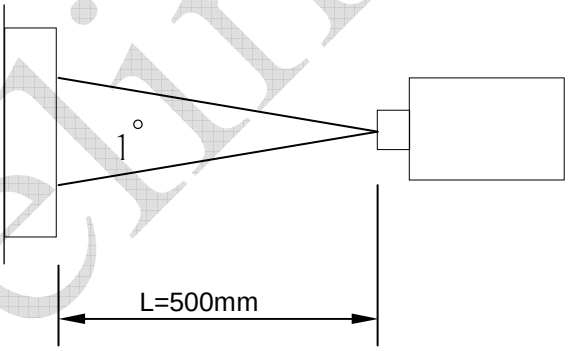
(Taransmittance, contrast ratio, response time, viewing angle results are using CPT LC + EWV Polarizer + Corresponding Backlight, reference only)

Ambient condition：25 ± 2℃ ，60 ± 10% RH，under 10 Lunx in the darkroom.

ITEM		SYMBOL		CONDITION	MIN.	TYP.	MAX.	UNIT	REMARK
Transmittance (Without Polarizer)		T		$\theta = \phi = 0°$	12.5	15.3	---	%	Note 1
Transmittance (With Polarizer)		T_{PL}		$\theta = \phi = 0°$	3.9	4.8	---	%	Note 2
Contrast Ratio		CR			400	500	---	--	Note 3
Response Time		Tr+Tf		$\theta = \phi = 0°$	---	30	40	ms	Note 4
Viewing Angle	Vertical	U	θ*2	CR≧10	55	65	---	degree	Note 5
		D			45	55	---	degree	
	Horizontal	L	ϕ*2		60	70	---	degree	
		R			60	70	---	degree	
Color Filter Chromacicity	W	x		$\theta = \phi = 0°$	0.289	0.309	0.329	--	Note 6
		y			0.322	0.342	0.362	--	
	R	x			0.630	0.650	0.670	--	
		y			0.312	0.332	0.352	--	
	G	x			0.297	0.317	0.337	--	
		y			0.555	0.575	0.595	--	
	B	x			0.119	0.139	0.159	--	
		y			0.112	0.132	0.152	--	
	NTSC				---	60	---	%	

Note 1. Measure device：DMS-803, Light source：C light（Wiith diffusion plate）。

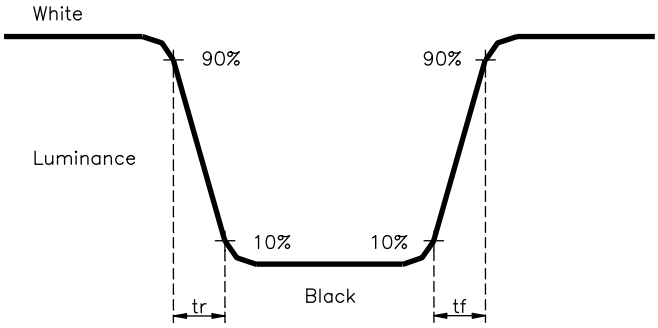
Note 2. Measure device：BM-5A (TOPCON)，viewing cone = 1°，I_L= 20mA。



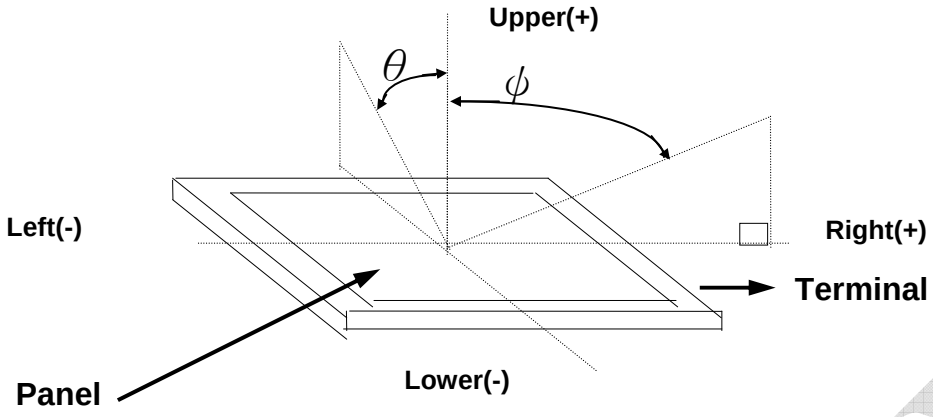
Note 3. Definition of Contrast Ratio：

CR = White Luminance (ON) / Black Luminance (OFF)

Note 4. Definition of response time：The response time is defined as the time interval between the 10% and 90% amplitudes.



Note 5. Definition of view angle(θ，ϕ)：



Note 6. Light source: C light.

6. RELIABILITY TEST ITEM

NO.	TEST ITEM	CONDITIONS
1	HighTemperature Operation	70℃, 240 hrs
2	Low Temperature Operation	-20℃, 240 hrs
3	High Temperature and High Humidity Operation	60℃ , 90% RH, 240 hrs
4	Thermal Shock Test	-30℃ ⟷ 80℃, (各0.5hr) 200 cycles
5	Cold Bubble	-20℃ stroge, 24hr, 5 times dropping(10cm, 5.4g, ϕ 11mm), 24hrs

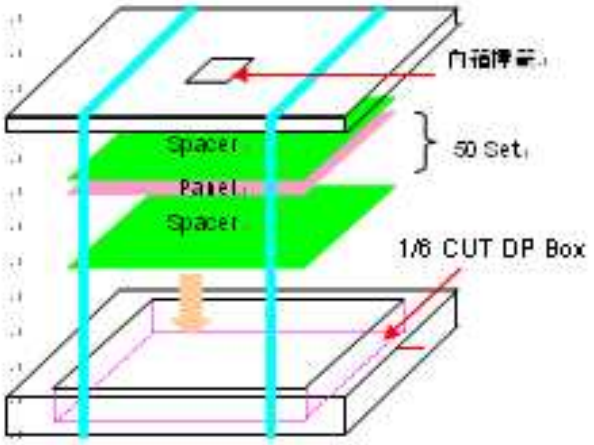
NOTE
1. All judgement of display are performed after temperature of panel return to room temperature.
2. Display function should be no change under normal operating condition.
3. Under no condensation of dew.
4. CPT only guarantee the above 3 test items, and without guarantee the others.

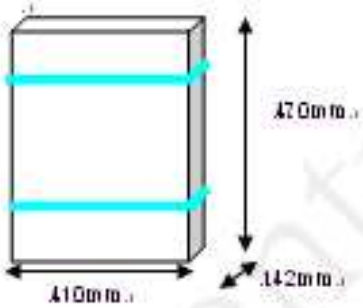
7. PACKAGE FORM

7.1 1/6CUT Package Form (Cell)

CUT：使用 1/6 CUT 與 1/4CUT 藍色 BOX

1/6CUT：





示意圖

1/4CUT：