Chunghwa Picture Tubes, Ltd.
Product Specification

To : **Ceramate** 光碁
Date : 110315

TFT LCD

CLAA090LC41CW

ACCEPTED BY : (V0.6)

APPROVED BY	CHECKED BY	PREPARED BY
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REVISION STATUS

Revision Notice	Description	Page	Rev. Date
0.0	First revision (Tentative)	--	2010/09/29
0.1	Add module weight / LED life time Revise Reverse Voltage（per LED）= 5 V/ 2D Drawing	P4,P11 P5,P14	2010/10/08
0.2	FPC Layer structure of CN1 part FPC layer structure of light bar	P.12 P.15	2010/10/15
0.3	Modify Bi value of FPC Layer structure Modify mechanical dimension Modify FPC layer structure of light bar Add Internal structure materials drawing Add Color Coordinate of white Modify temperature and humidity	P.13 P.14~17 P.17 P.18 P.19 P.21	2010/10/28
0.4	Modify Electrical Characteristics Modify Internal structure materials drawing	P.6 P.18	2010/11/10
0.5	Modify Power consumption/MDL weight Modify Backlight specification Modify FPC layer structure Modify FPC layer structure of light bar Modify NTSC specification	P.4 P.10 P.13 P.17 P.19	2010/12/15
0.6	Modify Gamma Voltage Modify L/R input signal Definition and panel figure of scanning direction Modify power, signal sequence Modify control signal symbol of vertical timing Modify absolute maximum ratings Modify Front Side/Rear side	P.7 P.12 P.8 P.9 P.6 P.15/16/17	2011/03/03

CONTENTS

1. OVERVIEW

CLAA090LC41CW is 9” color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs ,control circuit and LED backlight. By applying 800×480 images are displayed on the 9” diagonal screen. Display 262K colors by R.G.B signal input..

General specifications are summarized in the following table:

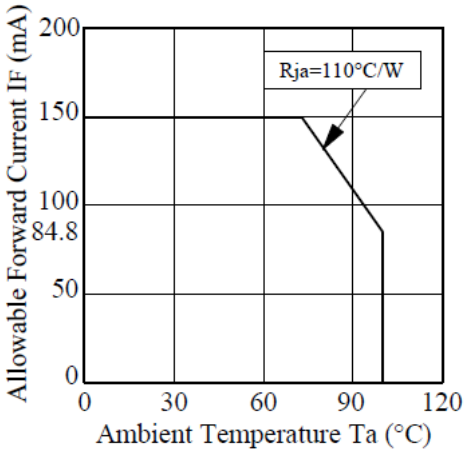
ITEM	SPECIFICATION
Display Area (mm)	198.0(H) x 112.08(V)
Number of Pixels	800(H) x 3(RGB) x480(V)
Pixel Pitch (mm)	0.2475 x 0.2335
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally white
Number of Colors	262K
Brightness (cd/m^2)	450nit(typ)
Response Time (ms)	25ms(typ.)
Contrast Ratio	400:1
Viewing Angle (CR≧10)	140degree (Horizontal.)
	120degree (Vertical)
Power Consumption (W)	3.434(Typ)
Interface connection	TTL
Module Size (mm)	210.7(H)x126.8(V)x5.7(D)-Without FPC 210.7(H)x126.8(V)x6(D)-With FPC
Module Weight (g)	245g
Backlight Unit	LED
Surface Treatment	Anti-Glare 3H

2. ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Min.	Max.	Unit	Note
Digital Supply Voltage	VCC	-0.5	3.96	V	
Analog Supply Voltage	VDDA	-0.5	14.85	V	
Digital input voltage	R0~R5 G0~G5 B0~B5	-0.3	VCC+0.3		
Gate On Voltage	VGH	-0.3	42	V	
Gate Off Voltage	VGL	-42.3	0.3	V	
Gate On-Gate Off Voltage	VGH-VGL	-0.6	42	V	
Forward Current （per LED）	If	-	150	mA	
Reverse Voltage（per LED）	VR	-	5	V	
Pulse forward current（per LED）	Ifp	-	200	mA	Note 1/2

Note1：Ifp Conditions ： Pulse Width ≦10msec；Duty ≦1/10
Note2：perating must under the condition as below drawing.
(Ambient Temperature /Allowable Forward Current) Each LED .

■ Ambient Temperature vs.
Allowable Forward Current



Note3：If users use the product out off the environmemtal operation range（temperature and humidity），it will have visual quality concerns.

3. ELECTRICAL CHARACTERISTICS

3.1 Typical operation conditions

Ta=25℃

Item	Symbol	Min.	Typ.	Max.	Unit.	Note.
Digital Supply Voltage	VCC	3	3.3	3.6	V	
Analog Supply Voltage	VDDA	(10.8)	(11.3)	(11.8)	V	
Gate On Voltage	VGH	17	18	19	V	
Gate Off Voltage	VGL	-6.6	-6	-5.4	V	
Common Voltage	VCOM	(4.8)	(5)	(5.2)	V	Note1
Gamma voltage	V1	-	(10.37)	-	V	
	V2	-	(8.89)	-	V	
	V3	-	(8.4)	-	V	
	V4	-	(8)	-	V	
	V5	-	(6.91)	-	V	
	V6	-	(4.92)	-	V	
	V7	-	(3.53)	-	V	
	V8	-	(3.1)	-	V	
	V9	-	(2.56)	-	V	
	V10	-	(1.17)	-	V	
Logic Input Voltage	VIH	0.7*VCC	-	VCC	V	
	VIL	GND	-	0.3*VCC	V	

Note1：Please adjust VCOM to make the flicker level be minimum.

3.2 Current consumption

Item	Symbol	Condition	Min.	Typ.	Max.	Unit.	Note.
Gate on Current	IVGH	VGH =18 V	-	0.5	1	mA	Note1
Gate off Current	IVGL	VGL= -6 V	-	1.5	2	mA	Note1
Digital Current	IVCC	VCC = 3.3V	-	5	15	mA	Note1
Analog Current	IVDDA	VDDA =11.3V	-	40	50	mA	Note1
Total Power Consumption	PC		-	487	645	mW	Note1

Note1: Typ. specification：Gray-level test Pattern
Max. specification：Black test Pattern

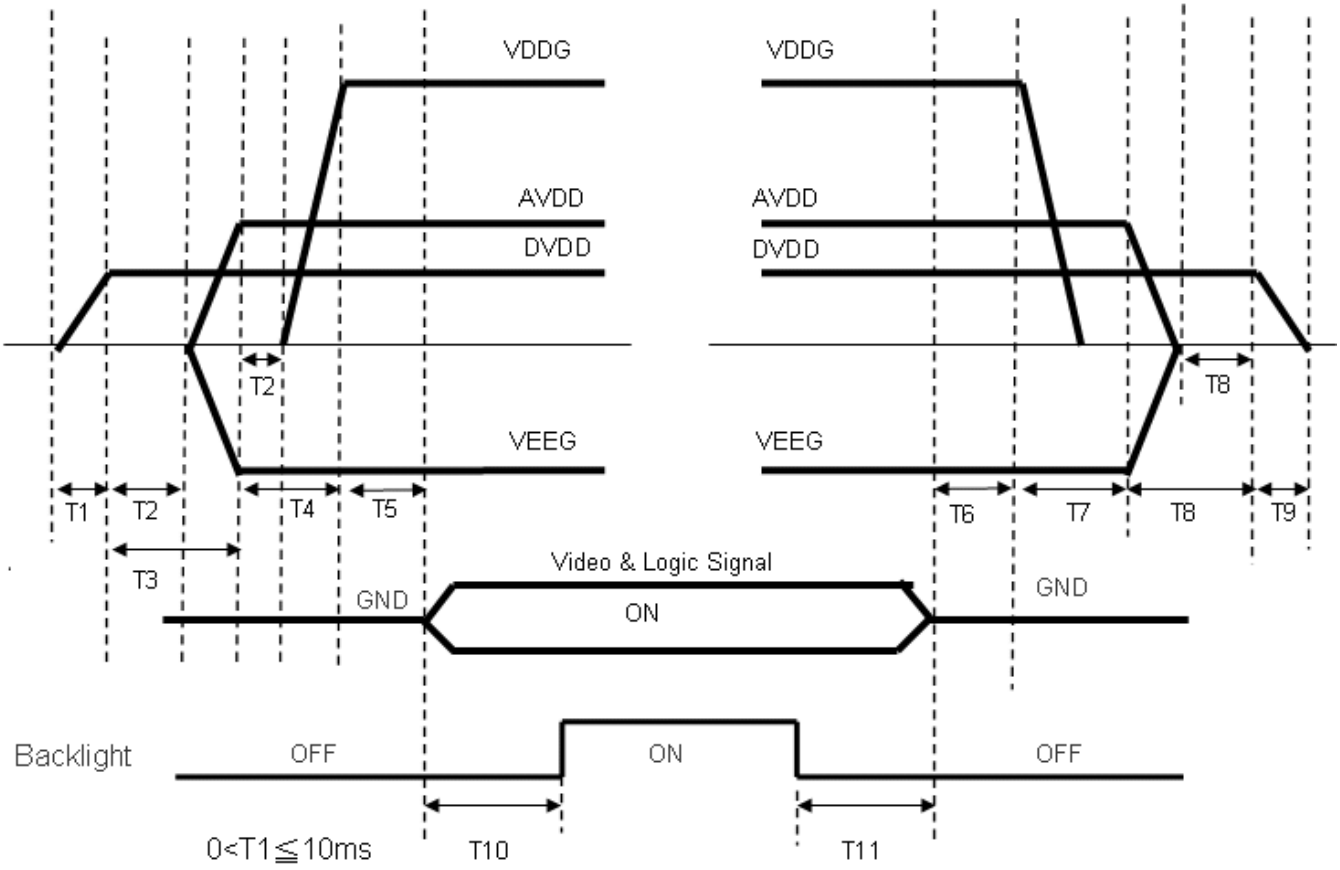
(a)Gray-level Pattern

(b)Black Pattern

3.3 Power、Signal sequence

Power On：DVDD→AVDD/VEEG→VDDG→Video &Logic Signal

Power Off：Video &Logic Signal→VDDG→AVDD/VEEG→DVDD



0<T1≦10ms

T2>0ms

T3>20ms

T4>10ms

0<T5≦10ms

T10≧200ms

T6>0ms

T7>0ms

T8>0ms

0<T9≦10ms

T11≧200ms

3.4 Timing characteristics of input signals

Horizontal timing

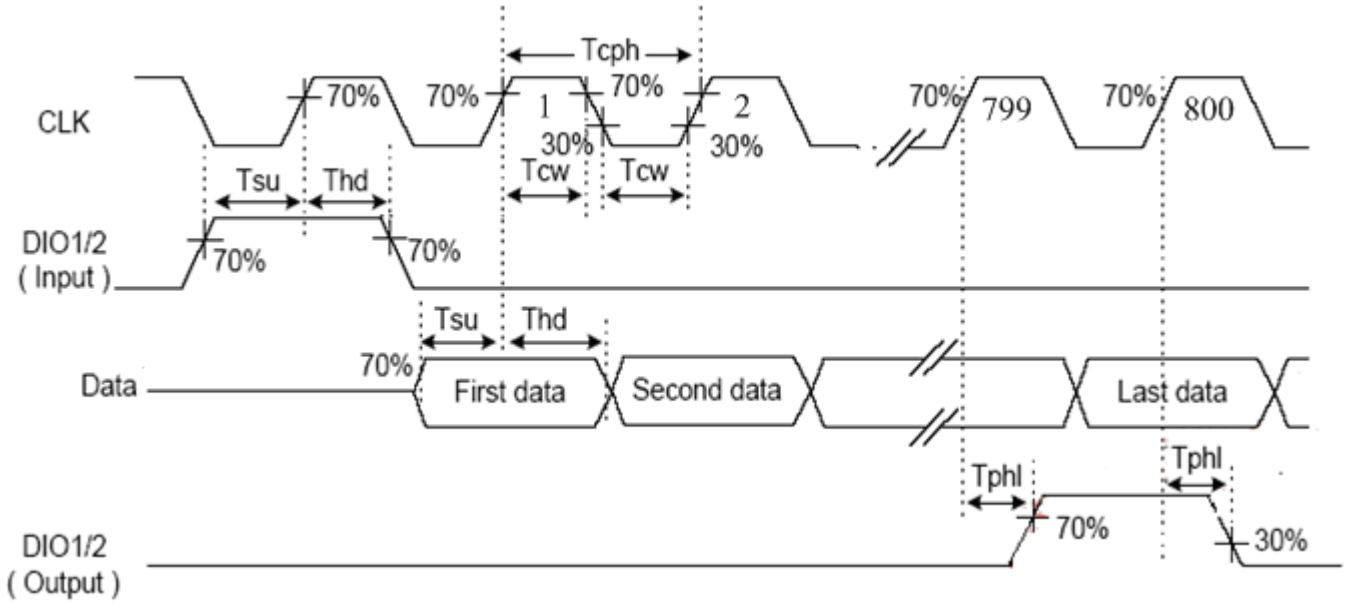
ITEM	SYMBOL	SPECIFICATION			UNIT
		Min	Typ	Max	
CLK Frequency	1/Tcph	25	33	40	MHz
CLK Pulse Width	Tcw	40%	-	60%	Tcph
Data Set-up Time	Tsu	4	-	-	ns
Data Hold Time	Thd	2	-	-	ns
Propagation Delay of DIO1/2	Tphl	6	10	15	ns
Time That The Last Data to LD	Tld	1	-	-	Tcph
Pulse Width of LD	Twld	2	-	-	Tcph
Time That LD to DIO1/2	Tlds	5	-	-	Tcph
POL Set-up Time	Tpsu	6	-	-	ns
POL Hold Time	Tphd	6	-	-	ns

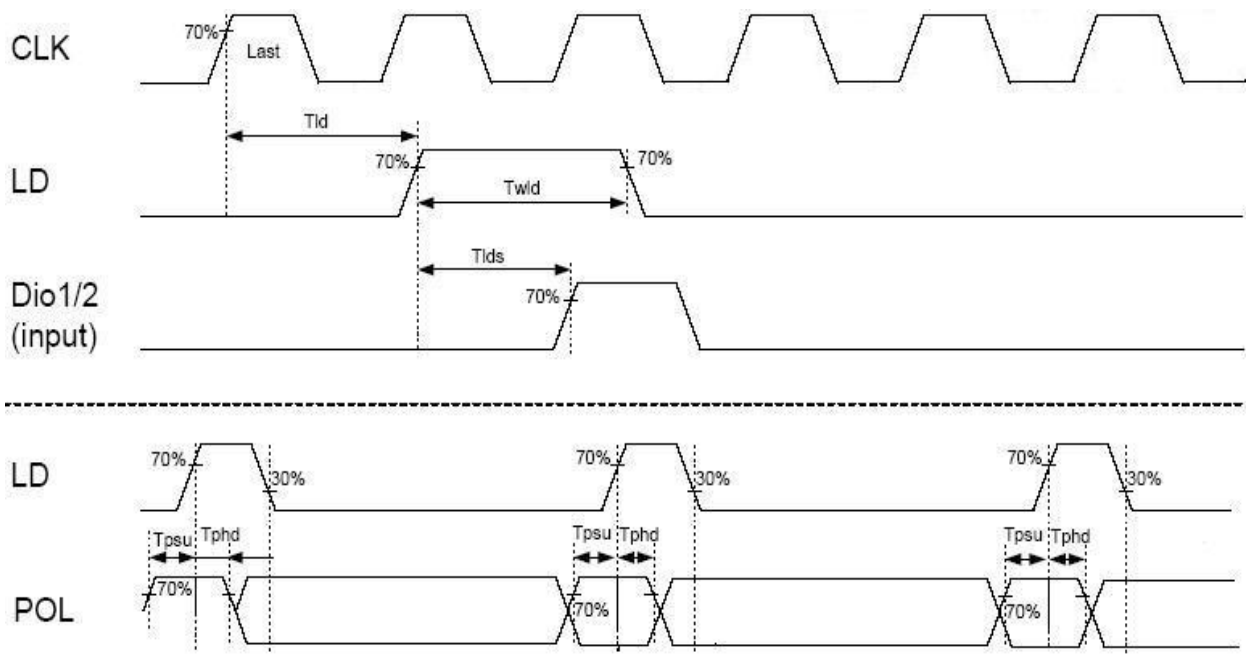
Vertical timing

ITEM	SYMBOL	SPECIFICATION			UNIT
		Min	Typ	Max	
CPV Frequency	$1/t_{CPV}$	-	-	38.4	Khz
CPV Pulse Width	t_{CPVH} / t_{CPVL}	2.5	-	-	us
STV1/2 Set-up Time	t_{SU}	700	-	-	ns
STV1/2 Hold Time	t_{HD}	700	-	-	ns
Output Enabled pulse width	twoe	1	-		μs

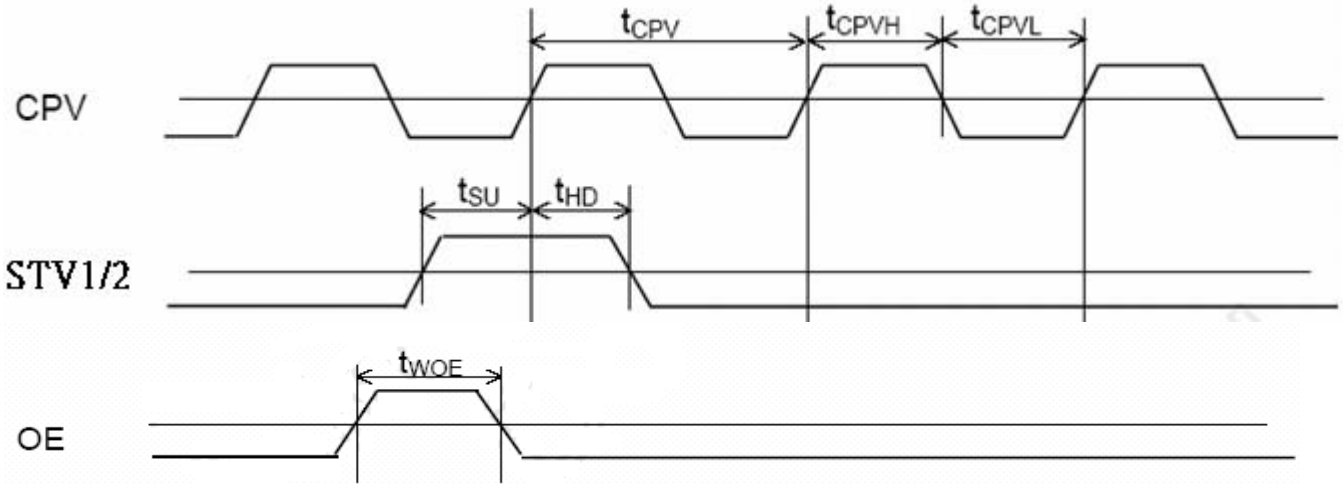
(2)Timing Chart

Horizontal timing





Vertical timing：



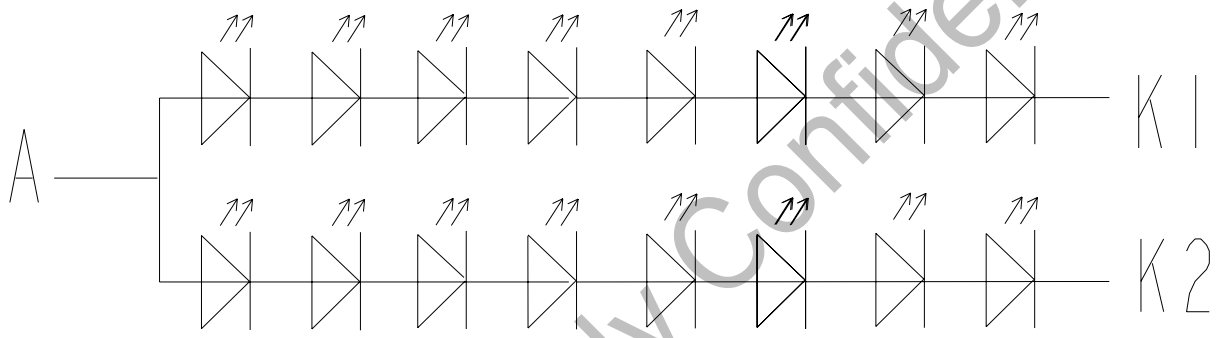
3.5 Backlight

Ta=25℃

Item	Symbol	Condition	Min	Typ	Max	Unit	Remarks
LED current	IL	Ta=25℃ Each serial=60mA		120		mA	
LED voltage	VL	Ta=25℃ Each serial=60mA	20.95	24.56	28.51	V	
Power consumption	WL	Ta=25℃ Each serial=60mA	-	2.947	-	W	
LED Lifetime		Ta=25℃ IF=60mA	30000			Hr	

Remarks：

*1)LED Circuit Diagram



*2) A：Anode(＋)，K：Cathode(－)

*3) Suggestion: Using the constant current control to avoid the leakage light and brightness quality issue.

*4) Definition of Led lifetime：Luminance < Initial luminance 50%.

*5)Measure the each serial voltage for VF1, VF2,must follow condition:MAX(VF1,VF2) - MIN(VF1,VF2)<3.28V.

4. INTERFACE CONNECTION:

4.1 CN1(Signal of interface) ：FH28-60S-0.5SH

Pin NO.	SYMBOL	DESCRIPTION
1	VCOM	Common Voltage(DC)
2	VCOM	Common Voltage(DC)
3	NC	NC
4	STV1	Vertical start Pulse Signal I/O
5	NC	NC
6	VGH	Gate ON Voltage +18V
7	NC	NC
8	VGL	Gate OFF Voltage -6V
9	NC	NC
10	VCC	Digital Power +3.3V
11	NC	NC
12	GND	Power Ground
13	GND	Power Ground
14	CPV	Vertical Clock
15	OE	Output Enable
16	U/D	Up / Down Control Pin
17	STV2	Vertical start Pulse Signal I/O
18	GND	Power Ground
19	GND	Power Ground
20	GND	Power Ground
21	DIO2	Horizontal start Pulse Signal I/O
22	VCC	Digital Power +3.3V
23	CLK	Horizontal Clock
24	GND	Power Ground
25	GND	Power Ground
26	VDDA	Power Supply for Analog Circuit
27	VDDA	Power Supply for Analog Circuit
28	L/R	Select Left / Right Shift
29	LD	Latch The Polarity of Output and Switch The New Data to Output
30	B5	Blue Data(MSB)
31	B4	Blue Data
32	B3	Blue Data
33	B2	Blue Data
34	B1	Blue Data
35	B0	Blue Data(LSB)
36	G5	Green Data(MSB)
37	G4	Green Data
38	G3	Green Data
39	G2	Green Data
40	G1	Green Data
41	G0	Green Data(LSB)
42	R5	Red Data(MSB)
43	R4	Red Data
44	R3	Red Data
45	R2	Red Data
46	R1	Red Data
47	R0	Red Data(LSB)
48	V10	Gamma Voltage Level 10
49	V9	Gamma Voltage Level 9

50	V8	Gamma Voltage Level 8
51	V7	Gamma Voltage Level 7
52	V6	Gamma Voltage Level 6
53	V5	Gamma Voltage Level 5
54	V4	Gamma Voltage Level 4
55	V3	Gamma Voltage Level 3
56	V2	Gamma Voltage Level 2
57	V1	Gamma Voltage Level 1
58	POL	Polarity Selection
59	DIO1	Horizontal start Pulse Signal I/O
60	GND	Power Ground

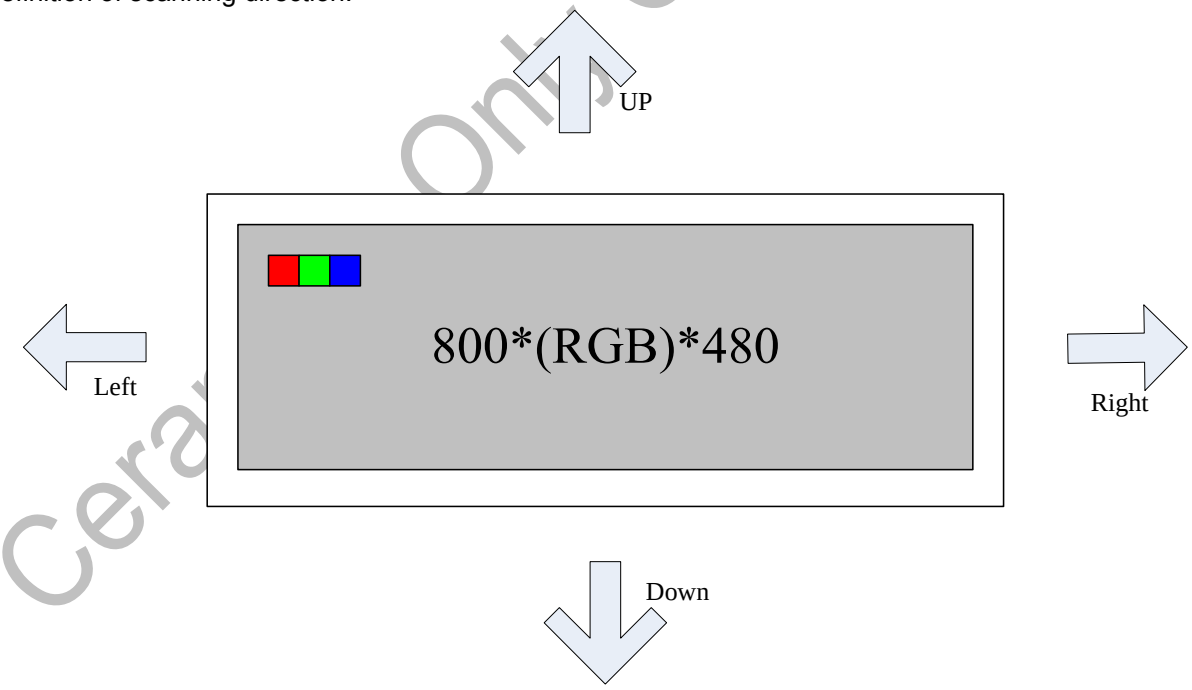
【Note1】L/R：Select left or right

L/R	DIO1	DIO2	SHIFT
VCC	Input	Output	Right
GND	Output	Input	Left

U/D：Shift up or down control

U/D	STV1	STV2	SHIFT
VCC	Input	Output	UP
GND	Output	Input	Down

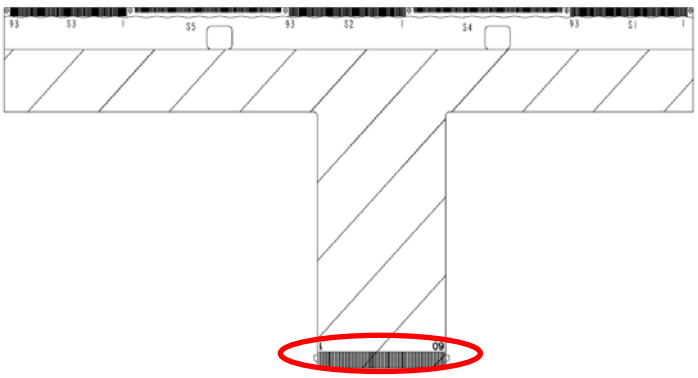
Definition of scanning direction.



4.2 CN2 (LED backlight)：Outlet connector : IRISO 9616S-08A-GF1

Pin no	Symbol	Function
1	A	ANODE
2	A	ANODE
3	NC	Dummy
4	K1	CATHODE1
5	K2	CATHODE2
6	NC	Dummy
7	NC	Dummy
8	NC	Dummy

4.3 FPC Layer structure of CN1 part



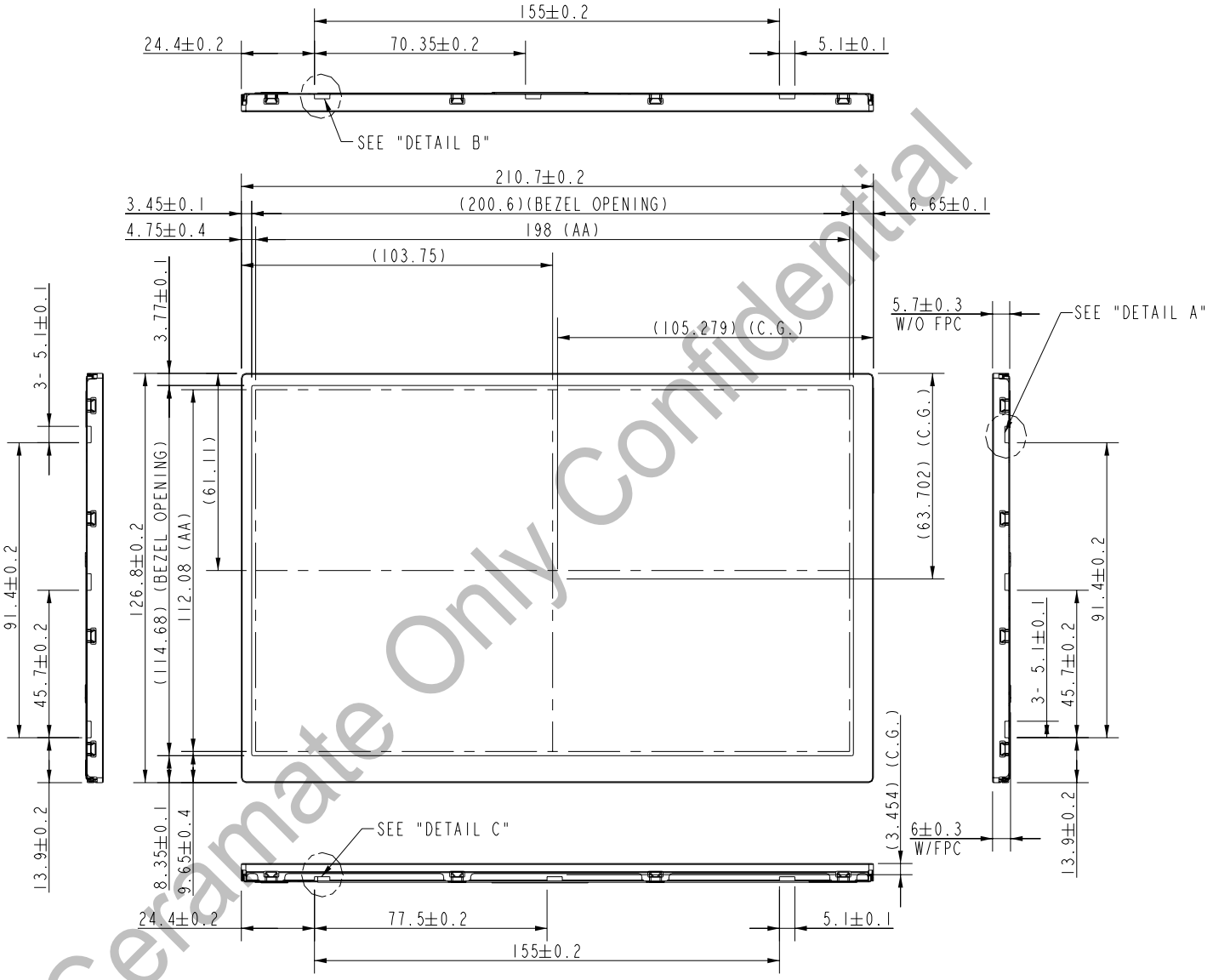
	Thickness (μm)
Au	0.10
NI	2.39
Copper Plating	17.78
L1 Conductor(ED)	17.78
Polyimide Film	25.40
L2 Conductor(ED)	17.78
Copper Plating	17.78
Adhesive	15.20
Polyimide Film	12.70
Adhesive	35.56
PI補強板	152.40

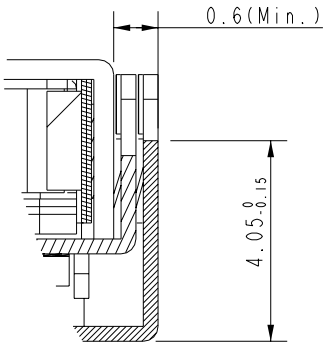
None Bi(-)

5. MECHANICAL DIMENSION

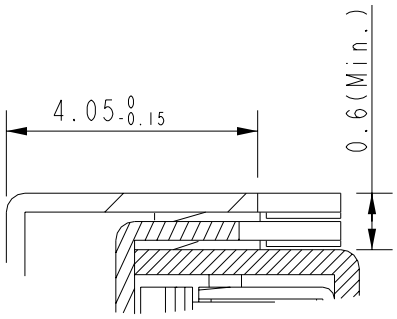
5.1 Front Sid

(Unit： mm)

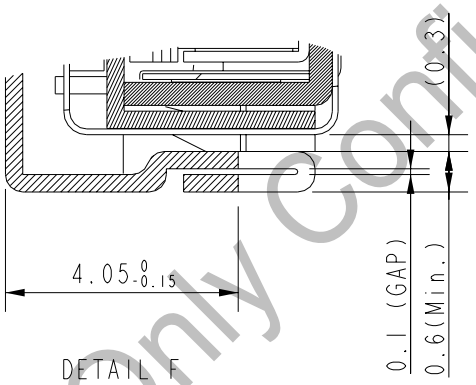




DETAIL D
SECTION XI-XI
SCALE 6:1



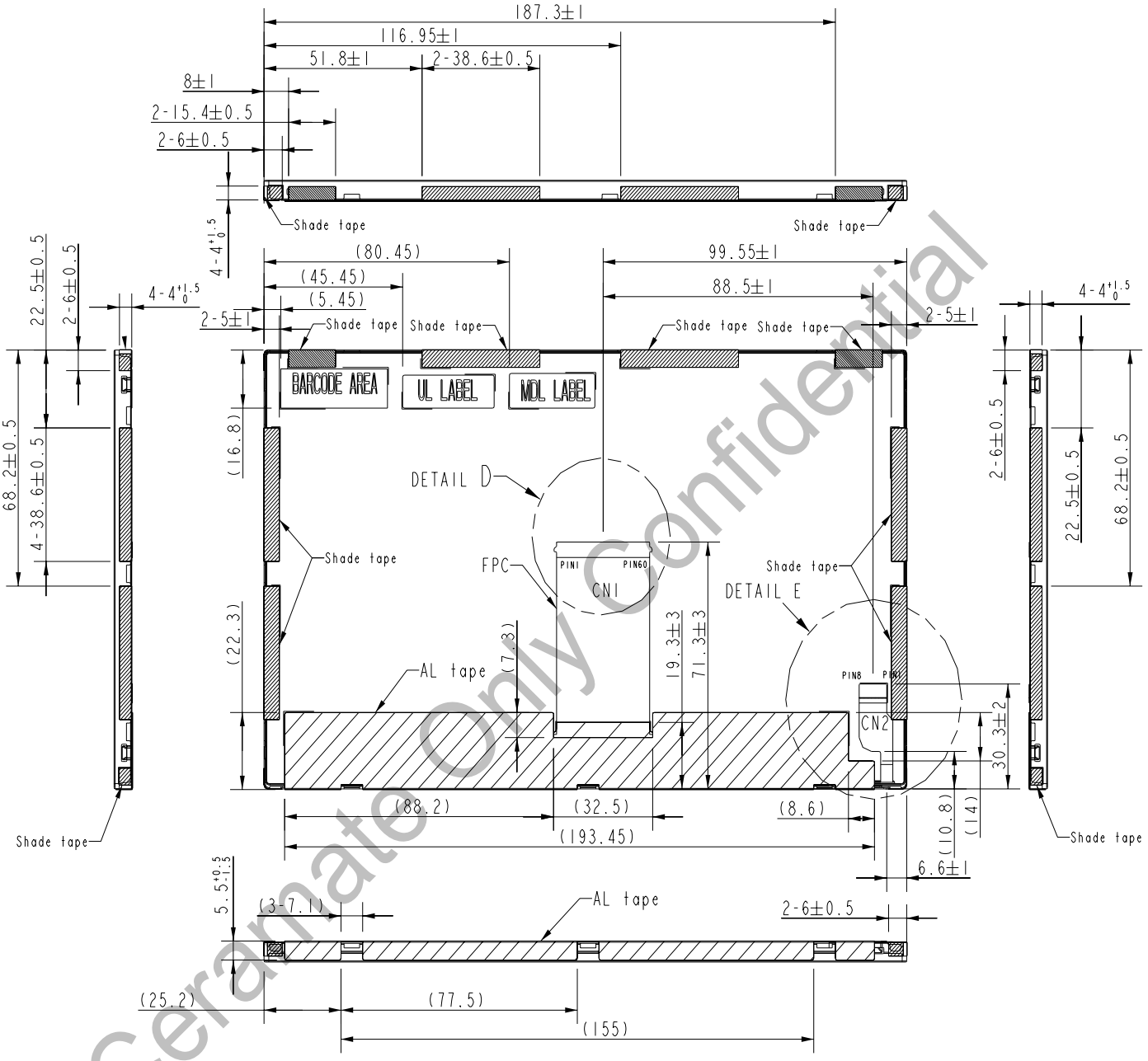
DETAIL E
SECTION YI-YI
SCALE 6:1

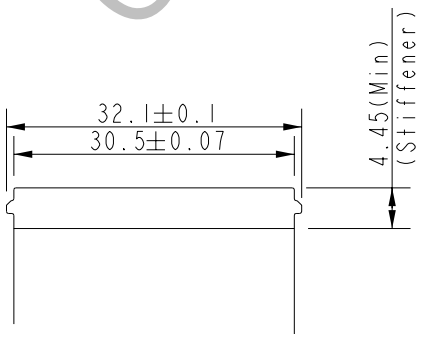


DETAIL F
SECTION YI-YI
SCALE 6:1

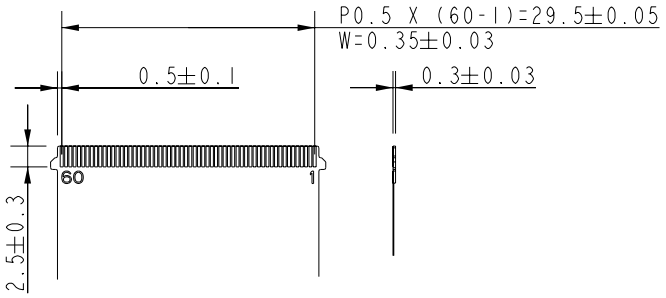
5.2 Rear Side

(Unit： mm)

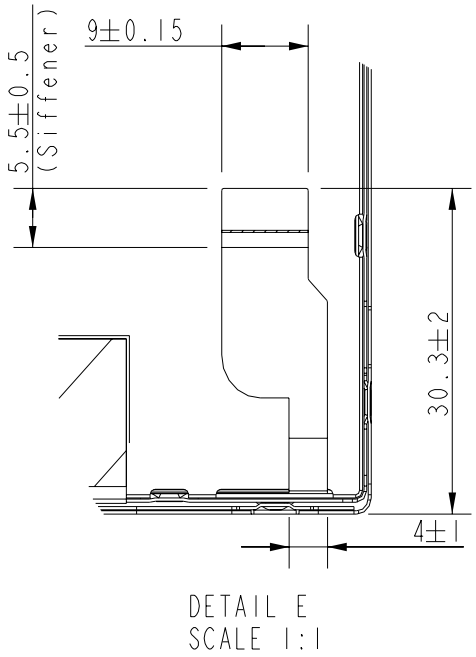


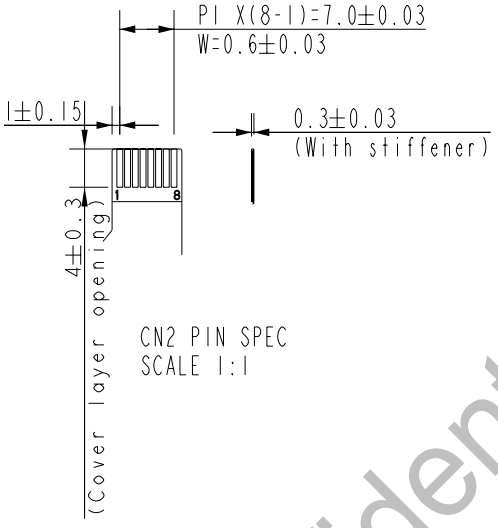


DETAIL D
SCALE 1:1



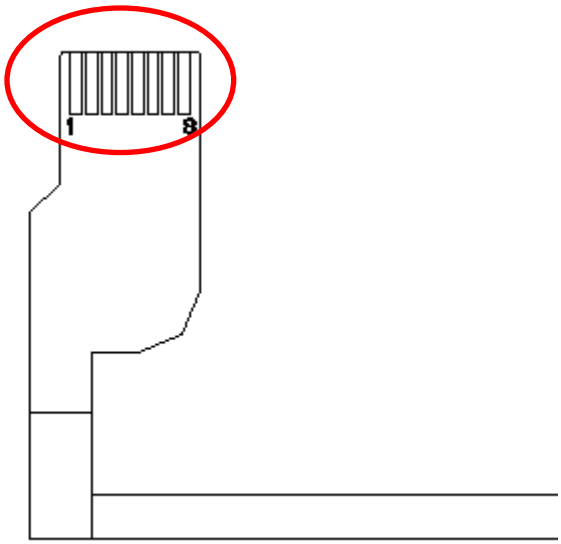
CNI PIN SPEC
SCALE 1:1





PIN ASS	
1	AI
2	AI
3	NC
4	KI
5	K2
6	NC
7	NC
8	NC

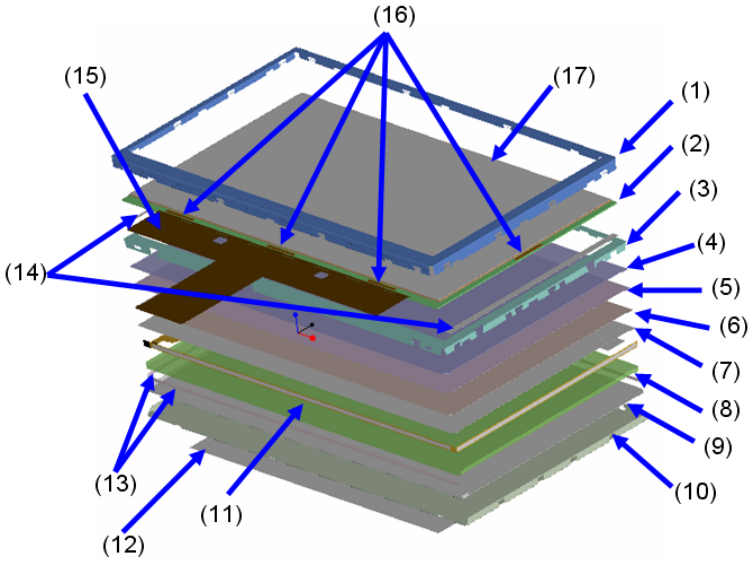
5.3 FPC layer structure of light bar



手指端厚度	Thickness (μm)
PLATING AU	0.1
PLATING NI	2.4
Copper Plating	17.78
L1 Conductor (RA)	17.78
Polyimide Film	25.4
Adhesive	35.56
Stiffener (PI)	203.2

Bi(-) about 300PPM

5.4 Internal structure materials drawing



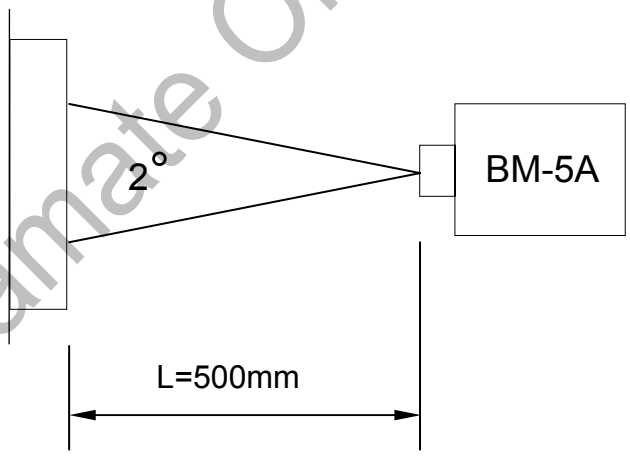
No.	Component	Material
(1)	Front-frame	Stainless Steel (SUS430)
(2)	LCD Panel	Glass
(3)	Mid-frame	Stainless Steel (SUS430)
(4)	DBEFD	PET (Polyethylene Terephthalate)
(5)	Lens1	PET (Polyethylene Terephthalate)
(6)	Lens2	PET (Polyethylene Terephthalate)
(7)	Diffuser	PET (Polyethylene Terephthalate)
(8)	LGP	PMMA (PolymethylMethacrylate)
(9)	Reflector	PET (Polythylene terephthalate)
(10)	Rear-frame	Aluminum (AL5052)
(11)	LED Light_bar	PET (Polythylene terephthalate), PI (Polyimide), Cu (Copper), Adhesive
(12)	Tapes (FPC)	PET (Polythylene terephthalate), Adhesive
(13)	Tapes (Reflector)	PET (Polythylene terephthalate), Adhesive
(14)	Tapes (LCD panel)	PET (Polythylene terephthalate), Adhesive
(15)	FPC	PET (Polythylene terephthalate), PI (Polyimide), Cu (Copper), Adhesive
(16)	Driver IC	Semiconductor
(17)	Polarizer	PET (Polythylene terephthalate), PVA (Polyvinyl alcohol), TAC (Triacetate cellulose)

6. OPTICAL CHARACTERISTICS

Ta=25℃

ITEM		SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
Constrast Ratio		CR	Point-5	300	400		--	1, 2, 3
Luminance(CEN)		Lw	Point-5	360	450		cd/m^2	1, 3
Luminance Uniformity		ΔL		70	80		%	1, 3
Response Time (White - Black)		Tr +Tf	Point-5	-	25	40	ms	1, 3, 5
NTSC		-	Point-5	65	70	-	%	1, 3
Viewing Angle	Horizontal		CR≧10 Point-5	120	140	--	°	1, 3
	Vertical			100	120	--	°	1, 2, 4
Color Coordinate	White	Wx Wy	Point-5	(0.273) (0.289)	(0.313) (0.329)	(0.353) (0.369)	--	1, 3
	Red	Rx Ry		(TBD) (TBD)	(TBD) (TBD)	(TBD) (TBD)		
	Green	Gx Gy		(TBD) (TBD)	(TBD) (TBD)	(TBD) (TBD)		
	Blue	Bx By		(TBD) (TBD)	(TBD) (TBD)	(TBD) (TBD)		

Note1: Measure condition：25℃±2℃，60±10%RH，under10 Lux in the dark room.BM-5A (TOPCON)，viewing angle2°，IL=120 mA（Backlight current），measurement after lighting on 10 mins.



Note2: Definition of contrast ratio：

Contrast Ratio (CR)= (White) Luminance of ON ÷ (Black) Luminance of OFF

Note3: Definition of luminance：Measure white luminance on the point 5 as figure.6-1
Definition of Luminance Uniformity: Measure white luminance on the point1~9 as figure.6-1
△L = [L(MIN)/L(MAX)]×100

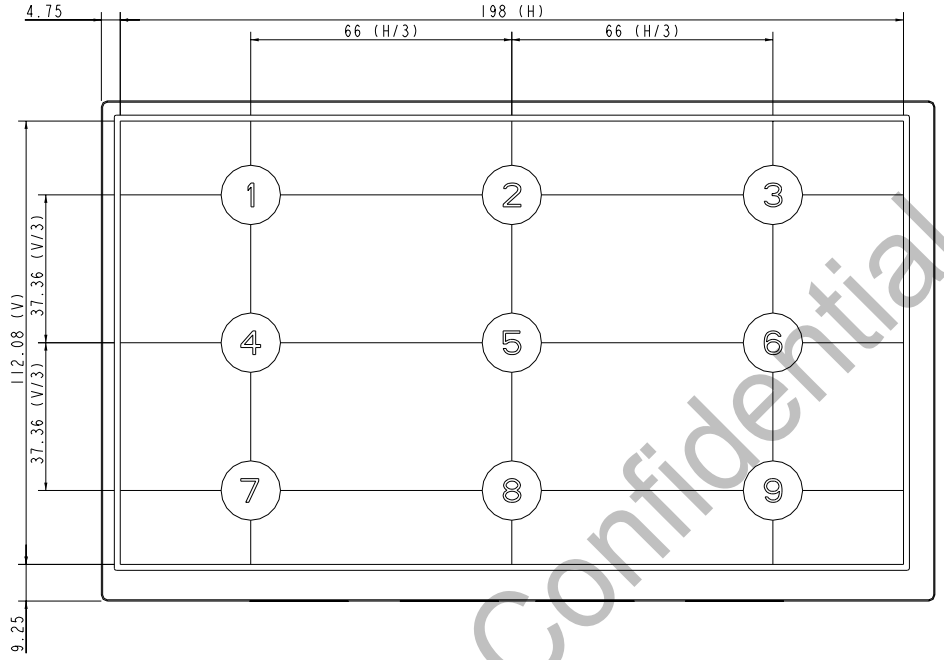


Fig.6-1 Measuring point

Note 4: Definition of Viewing Angle(θ,ψ),refer to Fig.6-2 as below：

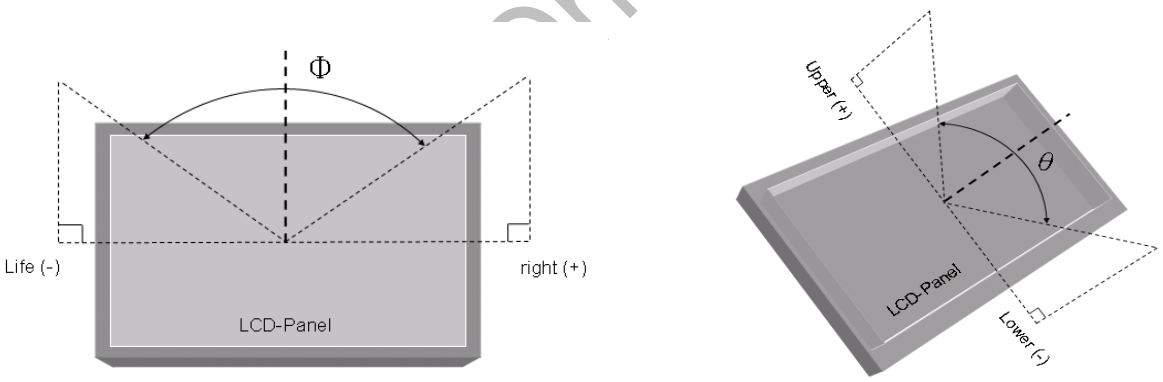


Fig.6-2 Definition of Viewing Angle

Note5: Definition of Response Time.(White-Black)

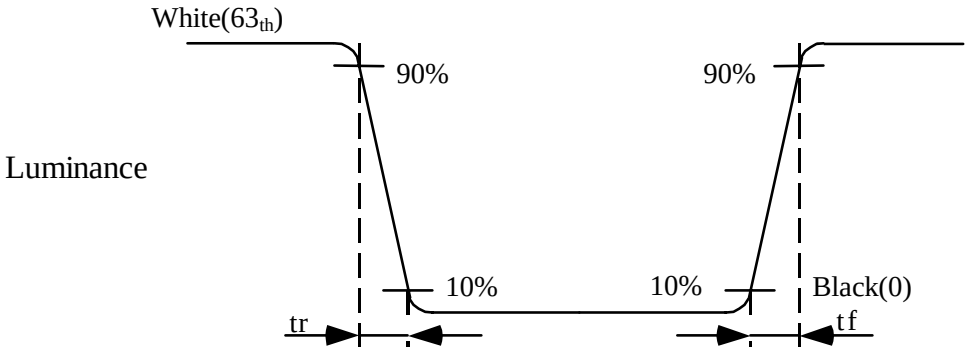


Fig.6-3 Definition of Response Time(White-Black)

7. RELIABILITY TEST

7.1 Temperature and Humidity

TEST ITEMS	CONDITIONS	NOTE
High Temperature Operation	85℃ ;1000hrs	
High Temperature Storage	90℃ ; 1000hrs	
High Temperature High Humidity Operation	60℃ ; 90%RH ;1000hrs (No condensation)	
Low Temperature Operation	-30℃ ; 1000hrs	
Low Temperature Storage	-40℃ ; 1000hrs	
Thermal Shock	–30℃(0.5hr) ~ 85℃(0.5hr) ; 1000 Cycles	Non-Operating

7.2 Shock and Vibration

ITEMS	CONDITIONS
Shock (Non-Operation)	● Shock level: 980m/s^2(equal to 100G). ● Waveform: half sinusoidal wave,6ms. ● Number of shocks: one shock input in each direction of three mutually perpendicular axes for a total of three shock inputs.
Vibration (Non-Operation)	● Frequency range：8~33.3Hz ● Stoke：1.3 mm ● Vibration： sinusoidal wave, perpendicular axis (both x, z axis:2Hrs, y axis 4Hrs). ● Sweep： 2.9G, 33.3 Hz -400 Hz ● Cycle： 15 min

7.3 Electrostatic Discharge

TEST ITEM	CONDITIONS	NOTE
ESD	150pF，330Ω，±8kV&±15kV air& contact test	1
	200pF，0Ω，±200V contact test	2

Note: Measure point :

1. LCD glass and metal bezel
2. IF connector pins

7.4 Judgment Standard

The judgment of the above test should be made as follow:

Pass: Normal display image with no obvious non-uniformity and no line defect.

Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defects.