Chunghwa Picture Tubes, Ltd.
Product Specification

To : **HAU DISPLAY**
Date : 130516

TFT LCD
CLAA069LA0ACW

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REVISION STATUS

Revision Notice	Description	Page	Rev. Date
0.0	First revision	--	2009/2/23
0.1	Add LED Life time	8	2009/4/16
	Revise interface connection	9	
	Revise MECHANICAL DIMENSION	13-15	
	Revise Reliability test	18	
0.2	Revise Backlight unit	8	2009/4/20
	Revise BLU connector	10	
0.3	Revise ABSOLUTE MAXIMUM RATINGS	5	2009/4/22
	Revise Power、Signal sequence	7	
0.4	Revise Power、Signal sequence	8	2009/04/24
	Revise Backlight unit	9	
	Revise Typical operation conditions	6	
0.5	Revise General specifications table	4	2009/06/12
	Revise ELECTRICAL CHARACTERISTICS	6	
	Revise TFT-LCD current consumption	7	
	Revise Backlight unit	9	
	Revise Horizontal Timing spec	12	
	Revise Optical Characteristics	17	
0.6	Revise Common Power Voltage	6	2009/10/23
	Add Condition	9	
	Revise CN2（BLU connector）	11~12	
	Revise Vertical Timing spec	13	
	Revise Vertical Timing Sequence	14	
	Revise Mechanical Dimension	15~18	
	Revise Response Time(max) 30-> 35	19	
	Revise Fig 7-1 Measuring point	20	
0.7	Revise ABSOLUTE MAXIMUM RATINGS and add note3	5	2009/12/10
	Revise Analog Power Voltage : min9.4/typ9.6/max9.8→min8.7/typ9.2/max9.8	6	
	Revise Common Power Voltage : min3.18/typ3.28/max3.38→ min3.18/typ3.38/max3.58	6	
	Revise Power、Signal sequence	8	
	Revise note3 & note4 of interface connection	10	
	Revise INPUT SIGNAL	13 & 14	
	Revise Color Coordinate	19	
1.1	Revise backlight resistor torelance 1%→3%	12	2010/2/11
	Revise LED FPC position (131.75) →131.75±1; (70) →70±1	16	
1.2	Add J&K power timing.	22	2010/3/25
1.3	Revised the Mechanical Dimension	16	2010/05/19
1.4	Revised the AVDD.	7	2010/11/11
1.5	Revised the Mating connector./CN2 suggested connector	12&17	2011/01/17
1.6	Modify color Bin resistance	12	2011/03/21
1.7	Power consumption 1.95→1.93	5	2011/08/30
	“SYMBOL” ：VCC→ DVDD；VGH→ VDDG；VGL→VEEG；VCDC→VCOM；V1~V10→VR1~VR10；IVGH→ IVDDG； IVGL→ IVEEG； IVCC→ IDVDD	7	

	Total Power Consumption typ. 413→396.5	7	
	Power、Signal sequence T4＞10ms→T4＞0ms；T5＞20ms→T5＞0ms；T6＜10ms→T6＞0ms	8	
	ITEM CPV Frequency→ VCLK Frequency	13	
1.8	“connector detailed Figure” update	17	2011/09/09

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1. OVERVIEW

CLAA069LA0ACW is 17.66cm (6.95") color TFT-LCD(Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit, and backlight.

The 6.95" screen produces a high resolution image that is composed of 800×480 pixel elements in a stripe arrangement.Display 262K colors by 6 Bit R.G.B signal input.Inverter for backlight and drive board for panel are not included in this module.

General specifications are summarized in the following table:

ITEM	SPECIFICATION
Panel Size	6.95 inch (panel diagonal)
Display Area (mm)	156.6(H)×81.6(V)
Number of Pixels	800(H) × 3 (RGB) × 480(V)
Pixel Pitch (mm)	0.19575 (H) × 0.170 (V)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally white
Number of colors	262K
Viewing Direction	6 o´clock(Max.Contrast,Gray level inversion)
Response Time (Tr+Tf)	20ms
Brightness (cd/m^2)	500nit (typ)
Viewing Angle (CR≧10)	140 degree(H)，120degree(V)
Electrical Interface(data)	TTL
Power consumption(W)	1.93W(typ)
Outline Dimension (in mm)	167.0(W) × 93.0(H) × 6(D)
Weight(g)	165g(typ)
BL unit	LED
Surface Treament	Anti-Glare

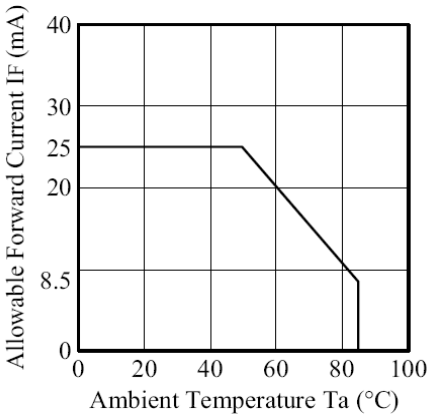
2. ABSOLUTE MAXIMUM RATINGS

The following are maximun values which, if exceeded, may cause faulty operation or damage to the unit.

Item	Symbol	Min.	Max.	Unit	Note
Digital Supply Voltage	DVDD	-0.3	5	V	
Analog Supply Voltage	AVDD	-0.3	13.5	V	
Gate On Voltage	VDDG	-0.3	40	V	
Gate Off Voltage	VEEG	-20	0.3	V	
Operation Temperature	Topa	-30	85	℃	【Note 1】
Storage Temperature	Tstg	-40	90	℃	【Note 1】
Forward Current(per LED)	If	-	25	mA	
Reverse Voltage(per LED)	VR	-	5	V	
Pulse Forward Current(per LED)	Ifp	-	80	mA	【Note 2】

【Note】

【Note1】 If uers use the product out off the environment operation range (temperature and humidity),it will concern for visual quality.
【Note2】 Ifp condition：Pulse width≦10msec，Duty≦1/10。
【Note3】Each one of the LED operation must meet the following diagram (Ambient Temperature /Allowable Forward Current)



3. ELECTRICAL CHARACTERISTICS

3.1 Typical operation conditions

Ta=25℃

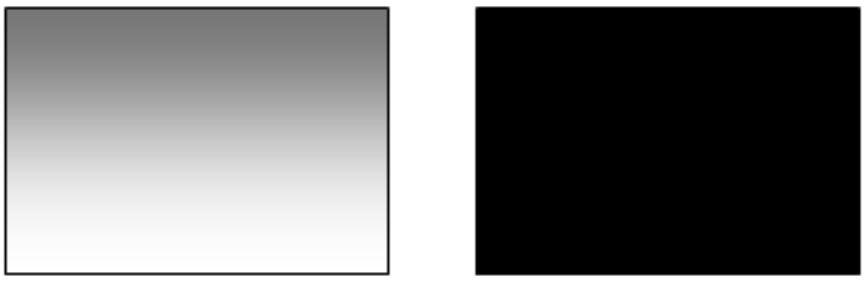
ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Digital Power Voltage	DVDD	3	3.3	3.6	V	
Analog Power Voltage	AVDD	8.7	9.2	9.8	V	
Gate On Power Voltage	VDDG	17	18	19	V	
Gate Off Power Voltage	VEEG	-6.6	-6	-5.4	V	
Common Power Voltage	VCOM	3.18	3.38	3.58	V	【Note1】
Gamma Voltage	VR 1	-	8.37	-	V	
	VR 2	-	6.89	-	V	
	VR 3	-	6.49	-	V	
	VR 4	-	6.15	-	V	
	VR 5	-	5.23	-	V	
	VR 6	-	3.71	-	V	
	VR 7	-	2.79	-	V	
	VR 8	-	2.45	-	V	
	VR 9	-	2.05	-	V	
	VR 10	-	0.57	-	V	
Input signal Voltage	VIH	0.7DVDD	-	DVDD	V	
	VIL	GND	-	0.3DVDD	V	

【Note1】Please adjust VCDC to make the flicker level be minimum.

3.2 TFT-LCD current consumption

ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	NOTE
Gate on power current	IVDDG	VDDG =18V	-	0.5	1	mA	【Note1】
Gate off power current	IVEEG	VEEG= -6V	-	0.5	1	mA	【Note1】
Digital power current	IDVDD	DVDD = 3.3V	-	5	10	mA	【Note1】
Analog power current	IAVDD	AVDD = 9.2V	-	40	50	mA	【Note1】
Total Power Consumption	PC		-	396.5	537	mW	【Note1】

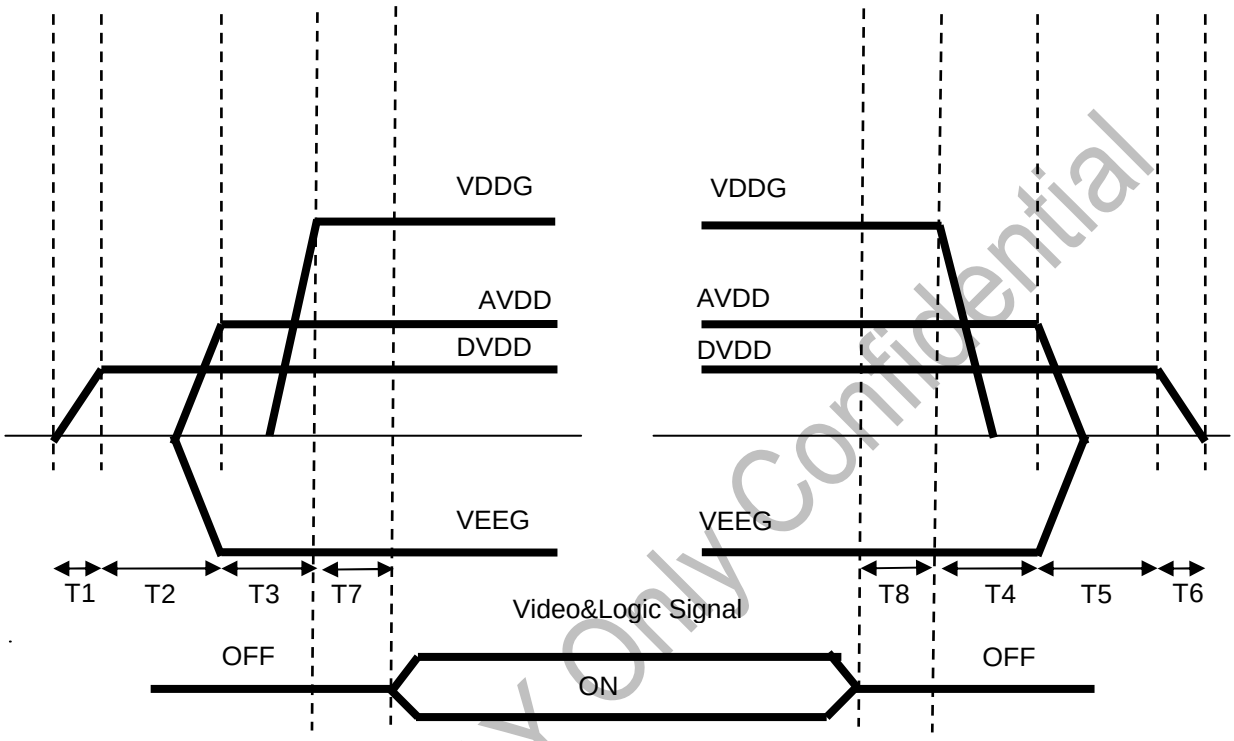
【Note1】
Typical: Under 64 gray pattern
Maximum: Under black pattern



(a)64 Gray 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	T4 ＞ 0ms
T2 ＞ 20ms	T5 ＞ 0ms
T3 ＞ 10ms	T6 ＞ 0ms
0＜T7≦10ms	0 ＜ T8 ≦ 10ms

【Note】

1. The power off sequence can turn off at the same time, it would not cause any panel damage. But it would cause some display noise on screen. Recommend system could turn backlight off first to avoid the nosie be seen.

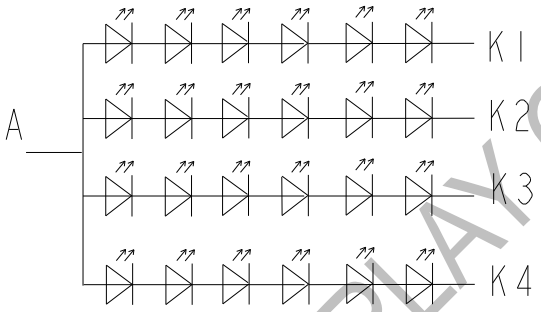
2. Recommend system could turn backlight on after all power on sequence are ready. And turn backlight off before power off sequence are starting.

3.4 Backlight unit

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
LED current	IL	Ta=25℃ IF=20mA	--	80	--	mA	
LED voltage	VL	Ta=25℃ IF=20mA	16.62	19.2	21.18	V	
Power consumption	WL	Ta=25℃ IF=20mA	--	1.536	--	W	
LED LifeTime		Ta=25℃ IF=20mA	15000			Hr	
		Ta=60℃ IF=20mA	10000			Hr	

【Note】

*1)LED Circuit Diagram



*2) A：Anode(＋)，K：Cathode(－)

*3) LED control must use the constant current control,to avoid the leakage light and brightness quality issue.

*4) Difinition of LED lifetime：Luminance < Initial luminance 50%

*5) To measure voltage of each series LED separately: Vf1, Vf2, Vf3, Vf4，and the measured values must conform to the conditions as below:
MAX (Vf1,Vf2,Vf3,Vf4) – MIN (Vf1,Vf2,Vf3,Vf4) < 1.56V

4. INTERFACE CONNECTION

4.1 CN1

Pin NO.	SYMBOL	DESCRIPTION
1	GND	Power Ground
2	DIO1	Horizontal start Pulse Signal I/O
3	NC	NC
4	VR 1	Gamma Voltage Level 1
5	VR 2	Gamma Voltage Level 2
6	VR 3	Gamma Voltage Level 3
7	VR 4	Gamma Voltage Level 4
8	VR 5	Gamma Voltage Level 5
9	VR 6	Gamma Voltage Level 6
10	VR 7	Gamma Voltage Level 7
11	VR 8	Gamma Voltage Level 8
12	VR 9	Gamma Voltage Level 9
13	VR 10	Gamma Voltage Level 10
14	D00	Red Data (LSB)
15	D01	Red Data
16	D02	Red Data
17	D03	Red Data
18	D04	Red Data
19	D05	Red Data (MSB)
20	D10	Green Data (LSB)
21	D11	Green Data
22	D12	Green Data
23	D13	Green Data
24	D14	Green Data
25	D15	Green Data (MSB)
26	D20	Blue Data (LSB)
27	D21	Blue Data
28	D22	Blue Data
29	D23	Blue Data
30	D24	Blue Data
31	D25	Blue Data (MSB)
32	LD	Latch The Polarity of Output and Switch The New Data to Output
33	SHL	Select Left / Right Shift
34	AVDD	Power Supply for Analog Circuit
35	AVDD	Power Supply for Analog Circuit
36	GND	Power Ground
37	GND	Power Ground
38	CLK	Horizontal Clock
39	DVDD	Digtal Power +3.3V
40	DIO2	Horizontal start Pulse Signal I/O
41	GND	Power Ground
42	GND	Power Ground
43	GND	Power Ground
44	STV2	Vertical start Pulse Signal I/O
45	UD	Up / Down Control Pin
46	OEV	Output Enable
47	VCLK	Vertical Clock
48	GND	Power Ground
49	GND	Power Ground
50	POL	Polarity Selection

51	XON	Gate Output all-on control
52	NC	NC
53	VEEG	Gate OFF Voltage -6V
54	NC	NC
55	VDDG	Gate ON Voltage +18V
56	NC	NC
57	STV1	Vertical start Pulse Signal I/O
58	NC	NC
59	VCOM	Common Voltage
60	VCOM	Common Voltage

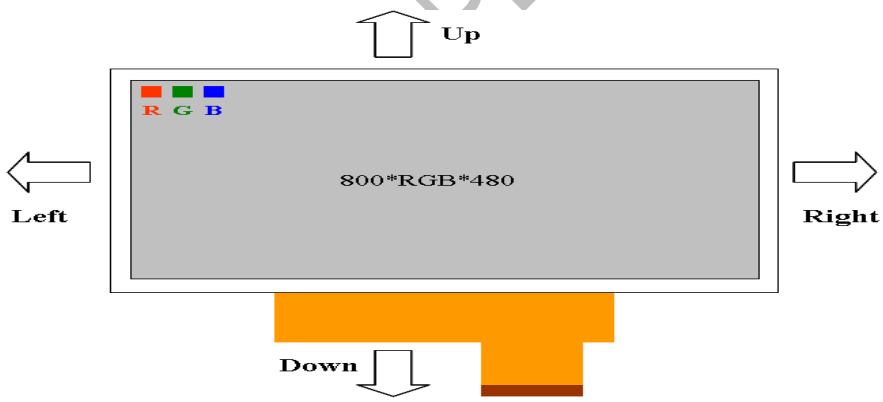
【Note】
*1) GND Pin had been connected to **“ground”, should not be “ Non-Connect ”.**
*2) SHL：Select left or right

SHL	DIO1	DIO2	SHIFT
DVDD	Input	Output	Right
GND	Output	Input	Left

*3) U/D：Shift up or down control

UD	STV1	STV2	SHIFT
DVDD	Input	Output	UP
GND	Output	Input	Down

Please refer to the scanning direction map



*4) XON: Gate Output all-on control
XON=GND, all Gate outputs are all-on at the same time.
XON=DVDD,Gate output don’t care this signal.

4.2 CN2（BLU connector）

Mating connector: FR03-S10DHF-2-E3000(CONN-TECK)

Pin No.	SYMBOL	FUNCTION
1	A	Anode
2	A	Anode
3	A	Anode
4	NC	NC
5	K1	Cathode
6	K2	Cathode
7	K3	Cathode
8	K4	Cathode
9	VBL	BL RESIST TEST
10	GND	GND

5. INPUT SIGNAL(TTL)

5.1 Timing Specification

5.1.1 Horizontal Timing spec：

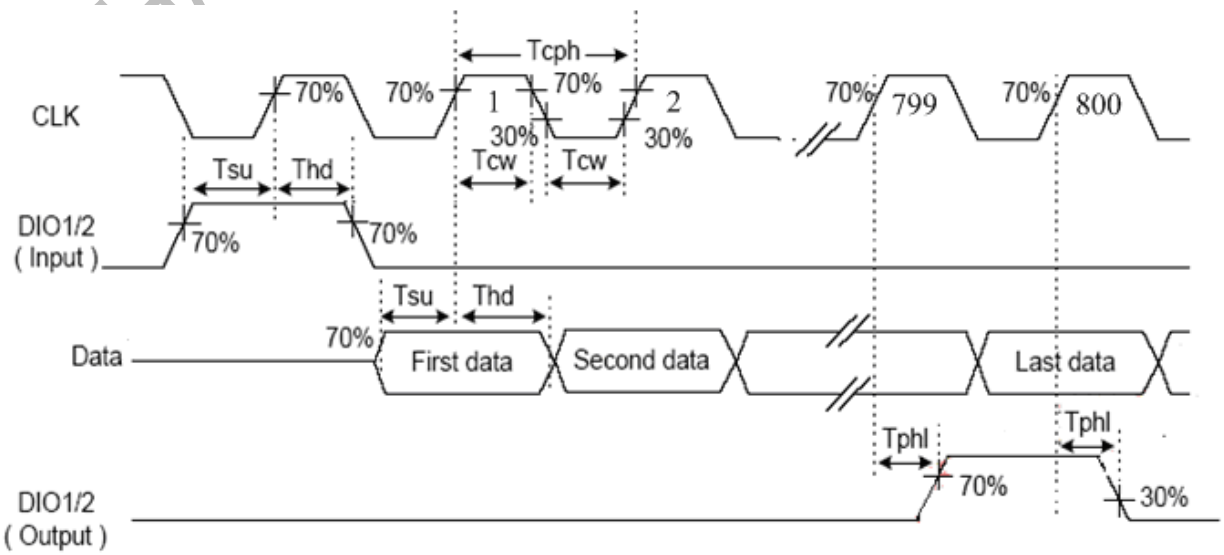
ITEM	SYMBOL	SPECIFICATION			UNIT
		MIN.	TYP.	MAX.	
CLK Frequency	1/Tcph	25	32	40	MHz
CLK Pulse Width	Tcw	40%	-	60%	Tcph
Data Set-up Time	Tsu	4	-	-	ns
Data Hold Time	Thd	2	-	-	ns
Propagation Delay of DIO2/1	Tphl	6	10	15	ns
Time That The Last Data to LD	Tld	1	-	-	Tcph
Pulse Width of LD	Twld	2	-	-	Tcph
Time That LD to DIO1/2	Tlds	5	-	-	Tcph
POL Set-up Time	Tpsu	6	-	-	ns
POL Hold Time	Tphd	6	-	-	ns

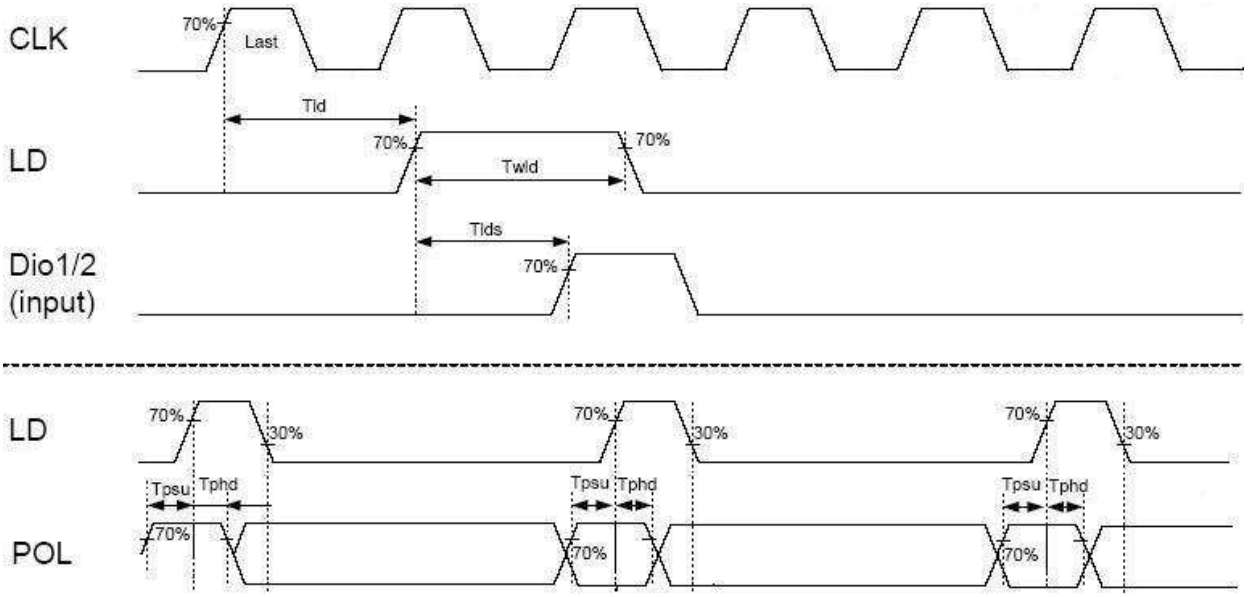
5.1.2 Vertical Timing spec：

ITEM	SYMBOL	SPECIFICATION			UNIT
		MIN.	UNIT	MIN.	
VCLK Frequency	1/Tcpv	-	-	200	Khz
VCLK 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 delay time of STV1/2	T_{PD1}	-	-	0.8	us
OE Set-up Time	T_{OESU}	0.5	-	2	us
OE Hold Time	T_{OEHD}	0.5	-	2	us
OE pulse width	T_{OEW}	1	-	4	us

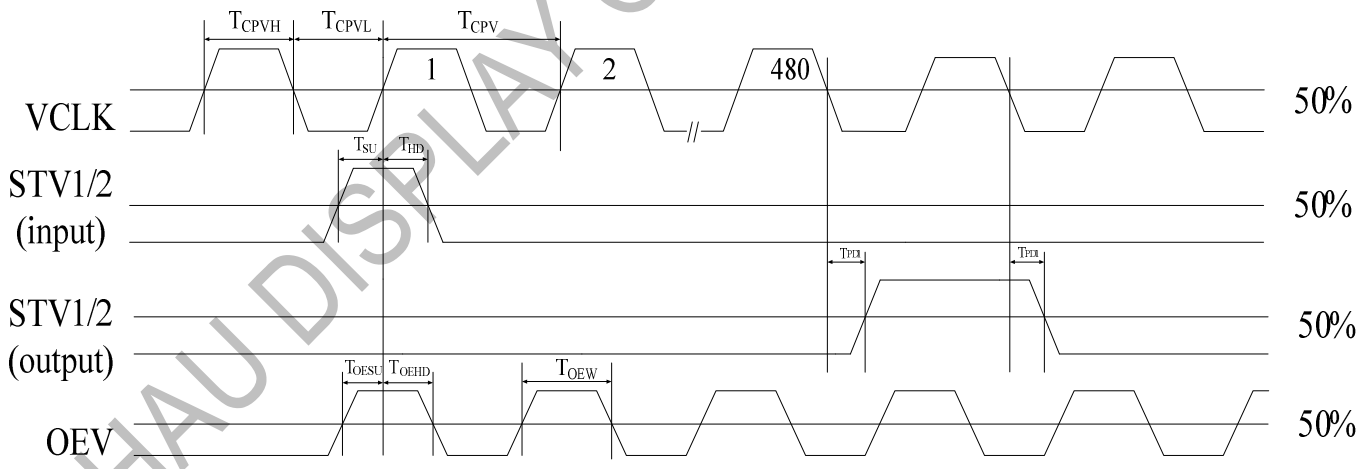
5.2 Timing Sequence (Timing chart)

5.2.1 Horizontal Timing Sequence





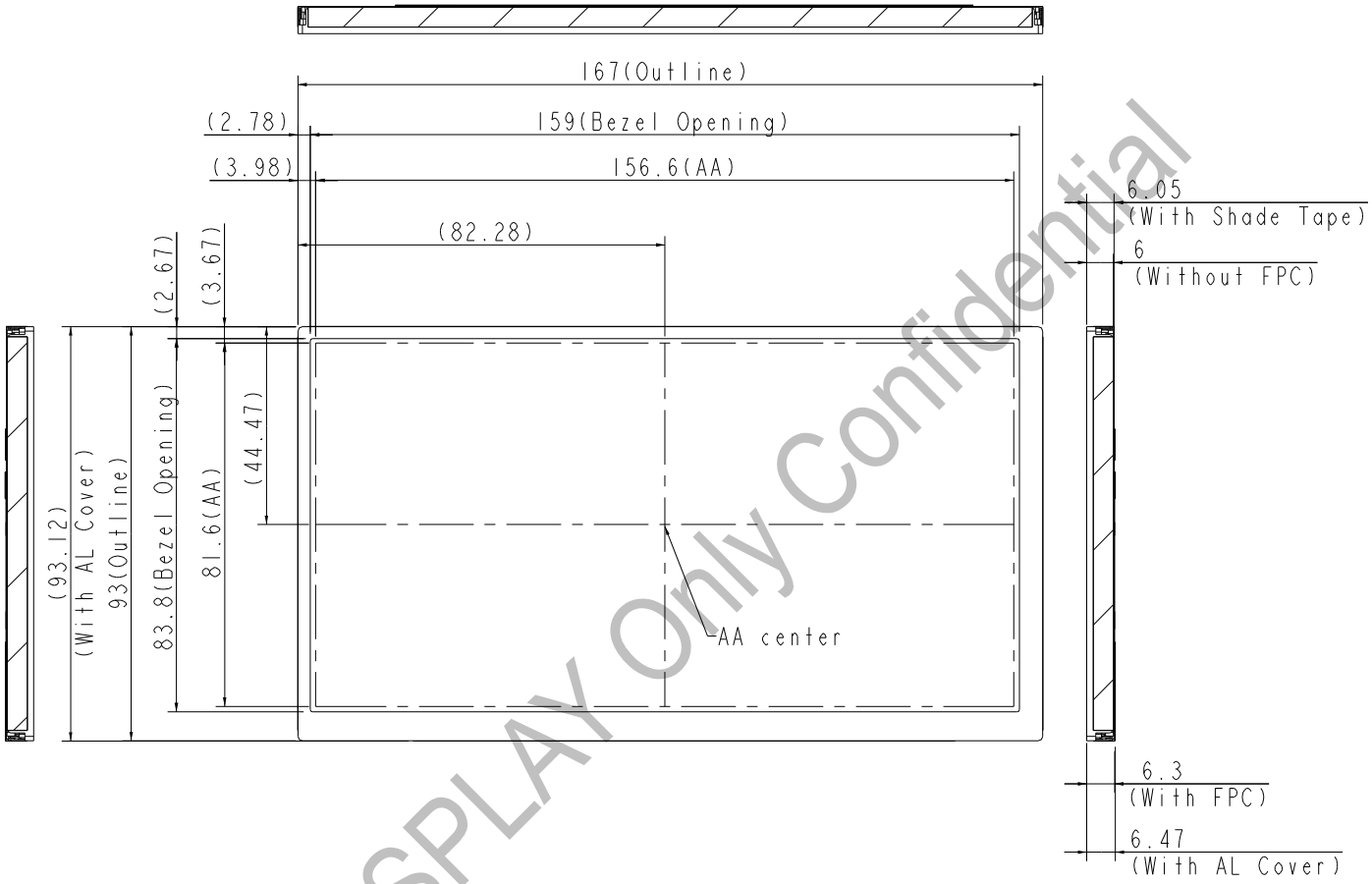
5.2.2 Vertical Timing Sequence



6. MECHANICAL DIMENSION

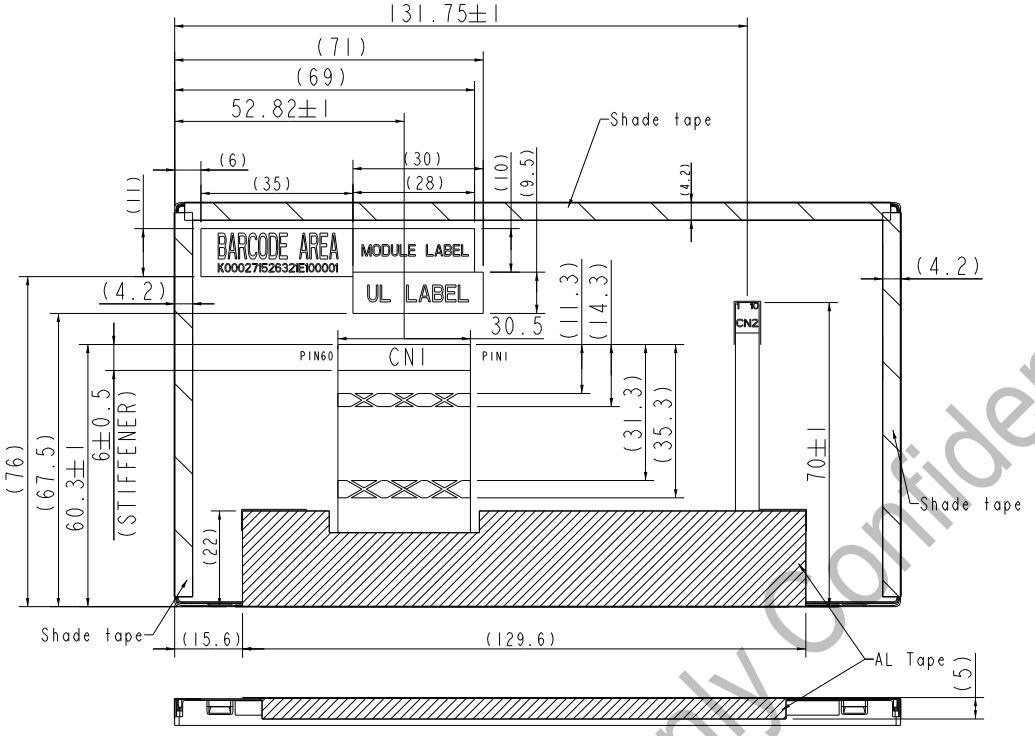
6.1 Front Side

[Unit：mm]



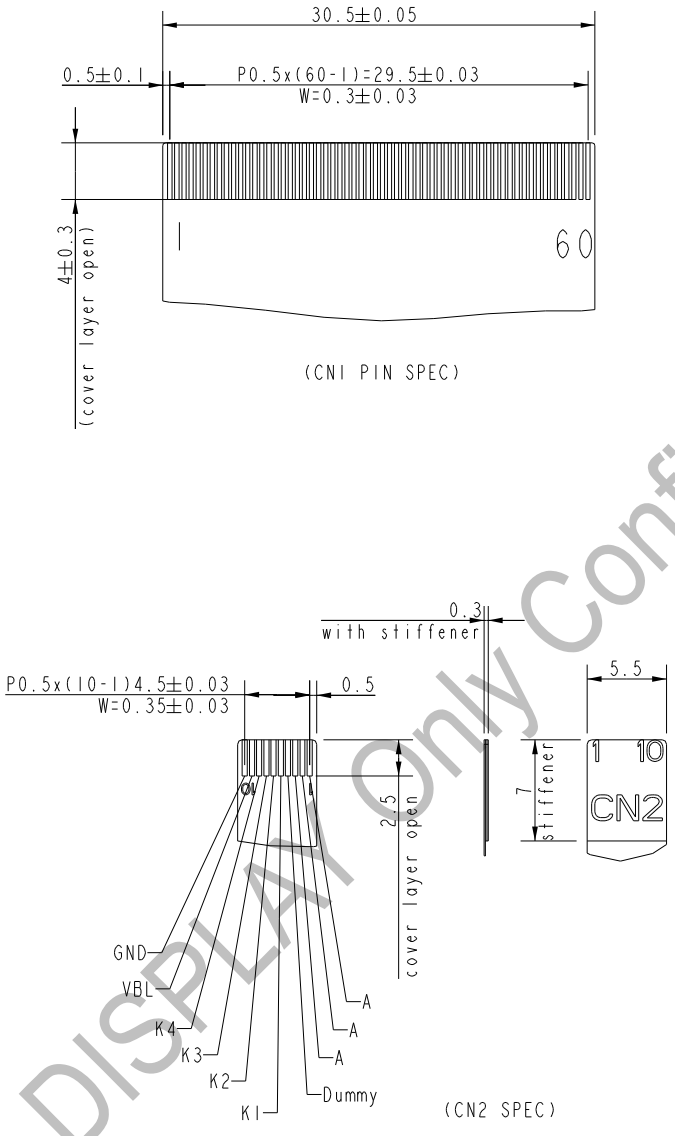
[Note]: General Tolerance = ±0.3mm

6.2 Rear Side



[Note]: General Tolerance = ±0.3mm

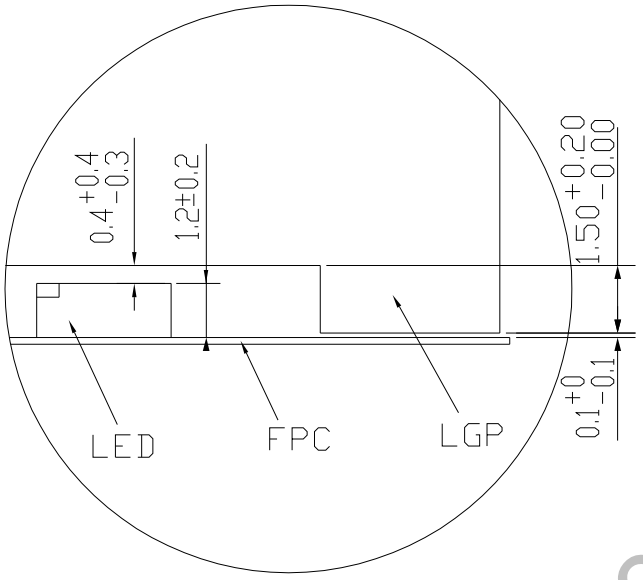
6.3 connector detailed Figure



NOTE:

1.General tolerance=±0.3mm
2.CN1 suggested connector(60pin):
STARCONN 089K60-000100-G2-R(or other compatible connectors)
3.CN2 suggested connector(10pin):
CONN-TECK FR03-S10DHF-2-E3000(or other compatible connectors

6.4 Gap Between LED&LGP Spec

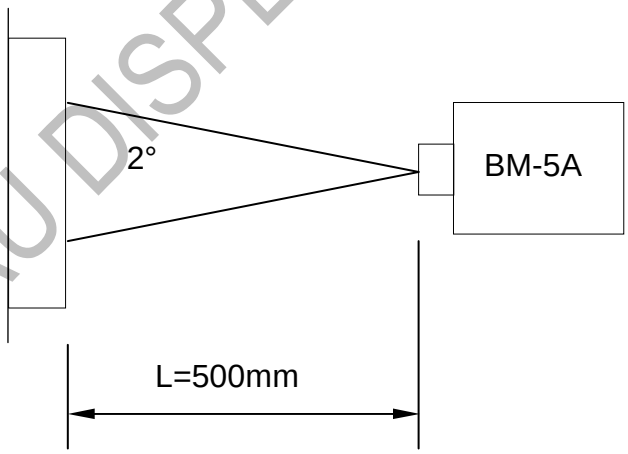


7. OPTICAL CHARACTERISTICS

Ta=25℃

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast		CR	$\theta = \phi = 0°$ Point-5	300	400	--	--	*1) *2) *3)
Luminance	Luminance (CEN)	Lw		400	500	--	cd/m2	*2) *3)
	Luminance Uniformity	ΔL		70	80	--	%	*2) *3)
Response Time		Tr +Tf	$\theta = \phi = 0°$	--	20	35	ms	*3) *4)
View angle	Horizontal	ϕ	CR≥10 Point-5	120	140	--	°	*2) *3)
	Vertical	θ		100	120	--	°	*2) *3)
Color Coordinate	White	Wx Wy	$\theta = \phi = 0°$ Point-5	0.273 0.289	0.313 0.329	0.353 0.369	--	*2)*3)
	Red	Rx Ry		(0.600) (0.298)	(0.640) (0.338)	(0.683) (0.378)	--	
	Green	Gx Gy		(0.260) (0.585)	(0.300) (0.625)	(0.340) (0.665)	--	
	Blue	Bx By		(0.115) (0.022)	(0.155) (0.062)	(0.195) (0.102)	--	

Note：
Measure condition：25℃±2℃，60±10%RH，under10 Lux in the dark room. BM-5A (TOPCON)，viewing angle 2°，VCC=3.3V，LED current=80mA，measuring after lighting on for 10 min。



*1) Definition of contrast ratio：
Contrast Ratio (CR)= (White) Luminance of ON ÷ (Black) Luminance of OFF

*2) Definition of luminance：
Measure white luminance on the point 5 as figure 7-1
Definition of Luminance Uniformity:
Measure white luminance on the point1~9 as figure 7-1
△L = [L(Min)/L(Max)] ×100%

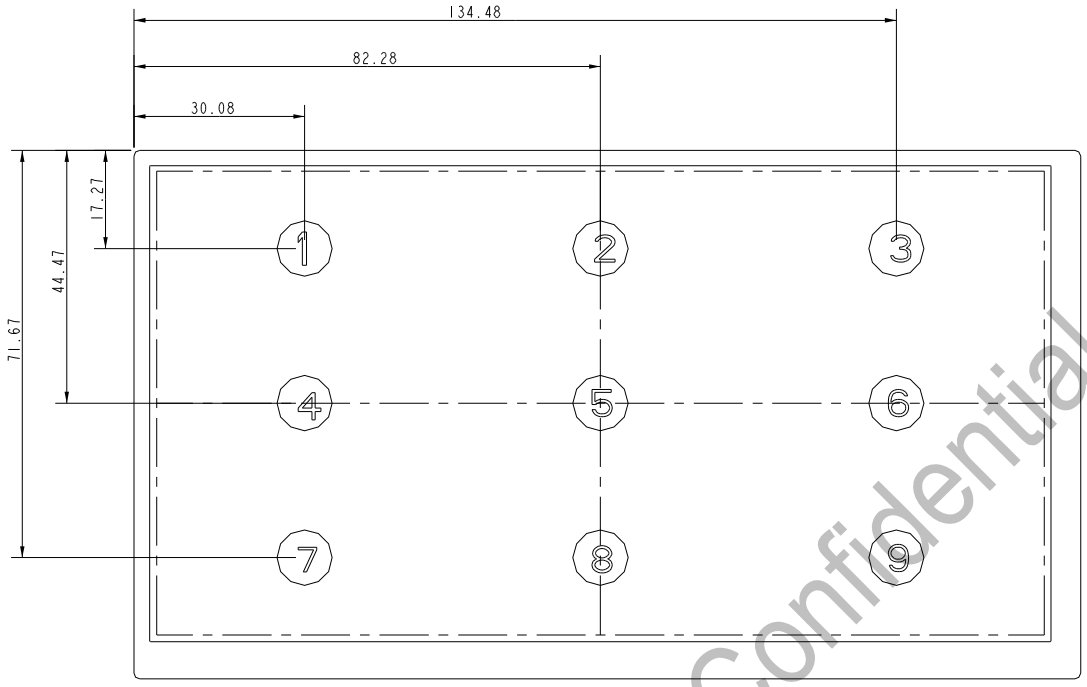


Fig 7-1 Measuring point

*3) Definition of Viewing Angle(θ,ψ),refer to Fig 7-2 as below：
These items are measured by EZ-CONTRAST(ELDIM) in the dark room. (no ambient light).

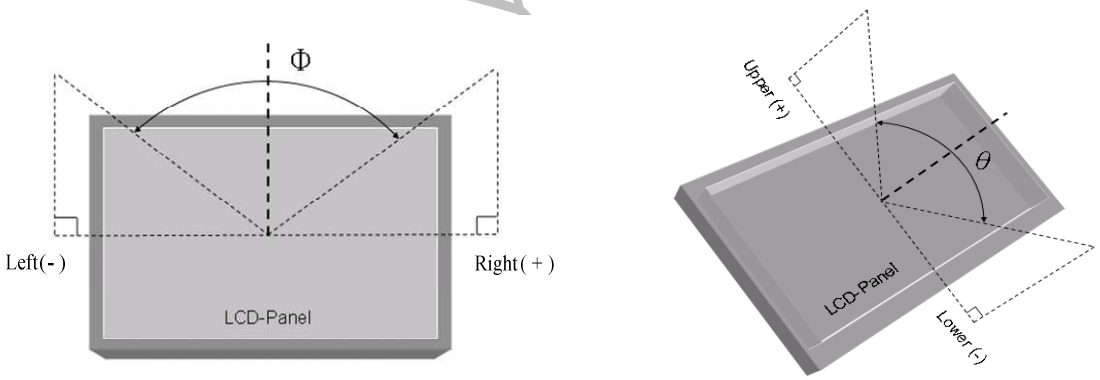


Fig 7-2 Definition of Viewing Angle

*4) Definition of Response Time.(White-Black)

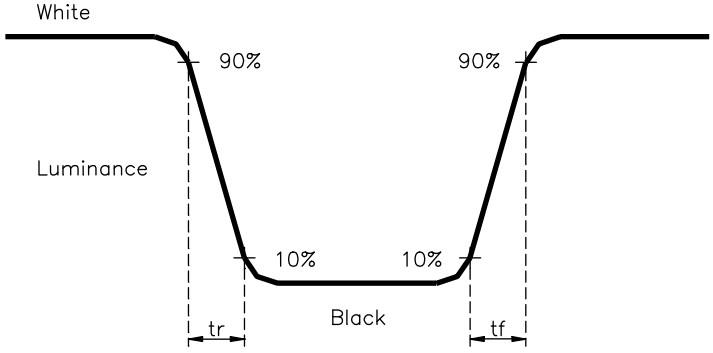


Fig 7-3 Definition of Response Time

8. RELIABILITY TEST

8.1. Temperature and humidity

TEST ITEMS	CONDITIONS	NOTE
High Temperature Operation	85°C, 1000Hrs	
High Temperature Storage	90°C, 1000Hrs	
High Temperature High Humidity Operation	60°C, 90% RH, 1000Hrs	No condensation
Low Temperature Operation	-30°C, 1000Hrs	
Low Temperature Storage	-40°C, 1000Hrs	
Thermal Shock	-30°C(1 hr)～85°C(1 hr), 500 CYCLE	

8.2. Shock and Vibration

TEST ITEMS	CONDITIONS
Shock (Non-operation)	735m/ s2 (equal to 75G) 11msec 1/2 Sine wave,. ±X，±Y，±Z，each axis 3 times.
Vibration (Non-operation)	15～60Hz 29.4m/s2 (equal to 3G) 2mm XYZ 2hrs each axis Sin wave

8.3 ESD

ITEM	CONDITION	NOTE
ESD	150pF，330Ω，±8KV & ±15KV air & contact test	【Note1】
	200pF，0Ω，±200V contact test	【Note2】

【Note1】 LCD glass and metal bezel。
【Note2】 IF connector pins。

8.4. 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 defect.