Chunghwa Picture Tubes, Ltd.
Product Specification

To : Pioneer
Date : 20160308

TFT LCD

CLAA102NDA1 CW

ACCEPTED BY : (V0.0)
Tentative

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REVISION STATUS

Revision Notice	Description	Page	Rev. Date
Ver. 0.0	First revision (Tentative)	--	2016/03/08

CONTENTS

1. OVERVIEW

CLAA102NDA1 CW is 10.2" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit, and backlight.

The 10.2" screen produces a high resolution image that is composed of 1024×600 pixel elements in a stripe arrangement. Display 16.2M colors by 8 Bit R.G.B signal input. Use 3.3 voltage to drive the power of LCD system, and 12.0 Voltage to drive the LED back light.

General specification are summarized in the following table：

ITEM	SPECIFICATION			
Panel Size	10.2 inch(panel diagonal)			
Display Area (mm)	222.72(H) x 130.5(V) (10.2-inch diagonal)			
Number of Pixels	1024(H) × 3(RGB) × 600(V)			
Pixel Pitch (mm)	0.2175 (H) × 0.2175 (V)			
Color Pixel Arrangement	RGB vertical stripe			
Display Mode	Normally white			
Number of Colors	16.7M (6Bit+Hi FRC)			
Brightness(cd/m^2)	600(typ.)			
NTSC	70(typ.)；60(min.)			
Contrast Ratio	1000(typ.)；700(min.)			
Response Time (Tr+Tf)	25ms(typ.)；30(max.)			
Outline Dimension(mm)		min.	typ.	max.
	Horizontal (H)	235.7	236	236.3
	Vertical (V)	147.7	148	148.3
	Depth (D)	5.5	5.8	6.1
Viewing Angle (BL on，CR≧10)	Horizontal(typ)：70(typ) ; 60(min) Left / 70(typ) ; 60(min) Right			
	Vertical(typ)：55(typ) ; 45(min) Up / 65(typ) ; 55 (min) Down			
Power Consumption（W）	4.8			
BL unit	LED			
Electrical Interface(data)	LVDS			
Viewing Direction	6 o´clock (Max. contrast ratio, Gray level inversion)			
Weight(g)	TBD			
Surface Treament	Anti-Glare，Hardness:3H			

2. ABSOLUTE MAXIMUM RATINGS

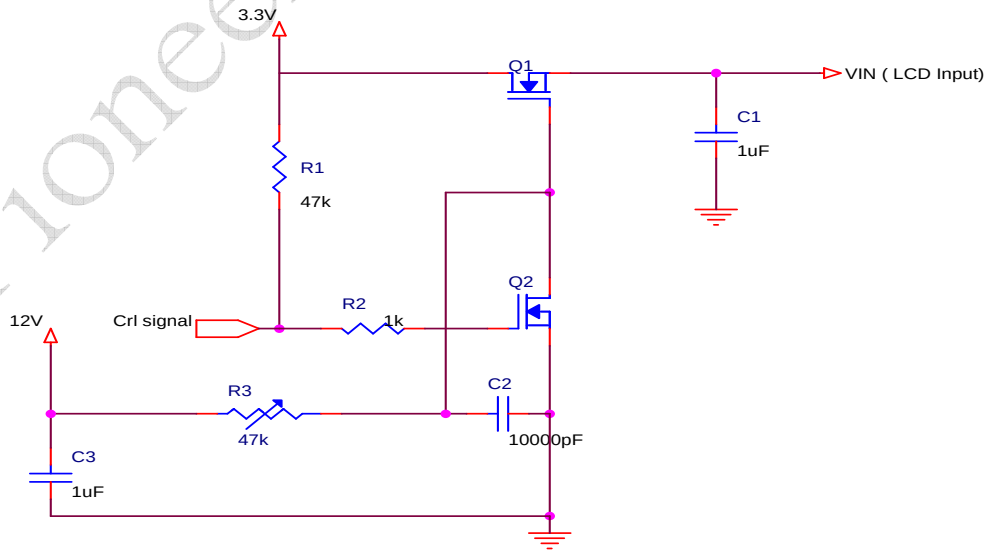
The following are maximun values which, if exceeded, may cause faulty operation or damage to the unit.

ITEM	SYMBOL	MIN.	MAX.	UNIT	NOTE
Power Supply Voltage	DVDD	-0.3	4.0	V	
Analog Supply Voltage	AVDD	-0.5	14.85	V	
Gate On Voltage	VGH	-0.3	40	V	
Gate Off Voltage	VGL	-20	0.3	V	
Gate On-Gate Off Voltage	VGH-VGL	-0.3	40	V	
Signal Input Voltage	NIND0 ~ NIND3 PIND0 ~ PIND3 NINC,PINC	-0.5	5	V	
LED Supply Voltage	VLED	-0.3	13.0	V	
Static Electricity	VESDc	-200	200	V	【Note 2】
	VESDm	-15K	15K	V	
ICC Rush Current	IRUSH	-	1	A	【Note 3】
Forward Current （per LED）	If	-	150	mA	
Reverse Voltage （per LED）	VR	-	5	V	
Pulse forward current （per LED）	Ifp	-	240	mA	【Note 4】
Operation Temperature	T_{op}	-30	85	℃	【Note 1】
Storage Temperature	T_{stg}	-40	90	℃	【Note 1】

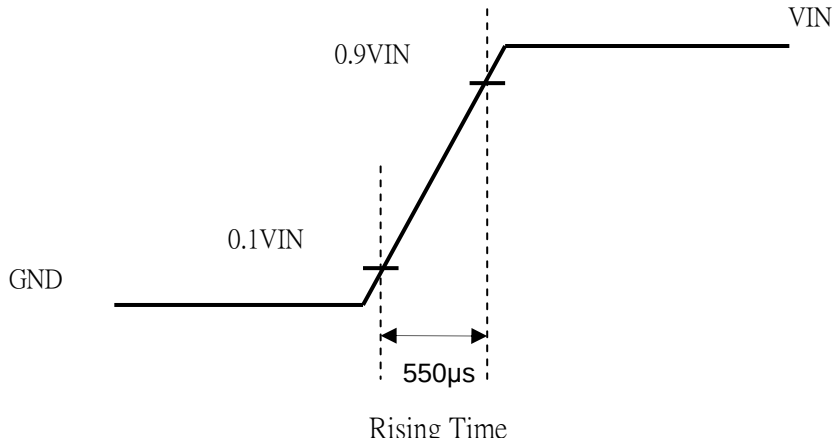
【Note1】If users use the product out off the environmemt operation range（temperature and humidity）,it will concern for visual quality.

【Note2】Test Condition: IEC 61000-4-2 ,
VESDc ：Contact discharge to input connector
VESDm：Discontact discharge to module

【Note3】The input pulse-current measurement system as below：



Control signal:High(+3.3V)→Low(GND)
Supply Voltage of rising time should be from R3 and C2 tune to 550 us.

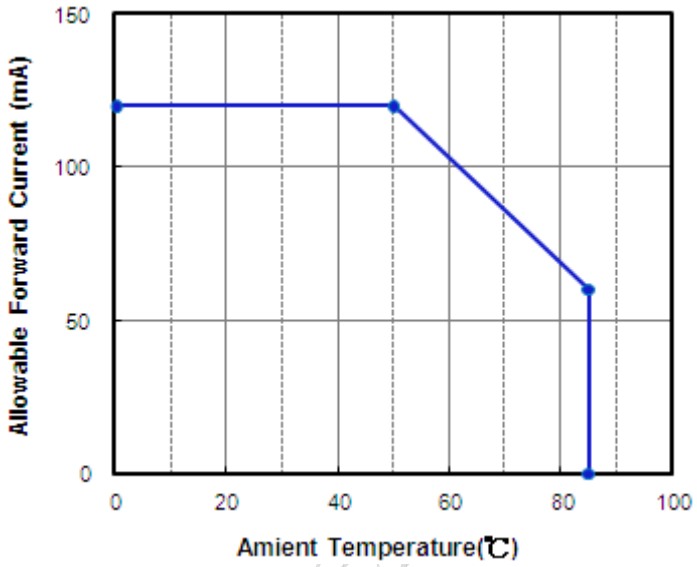


【Note4】

*1) If the product were used out of the operation and storage range, it will have quality issue.

*2) Ifp Conditions ： Pulse Width≦10msec，Duty≦1/10。

*3) *3) Each one of LED operation must be follow diagram of Ambient Temperature and Allowable Forward Current.



3. ELECTRICAL CHARACTERISTICS

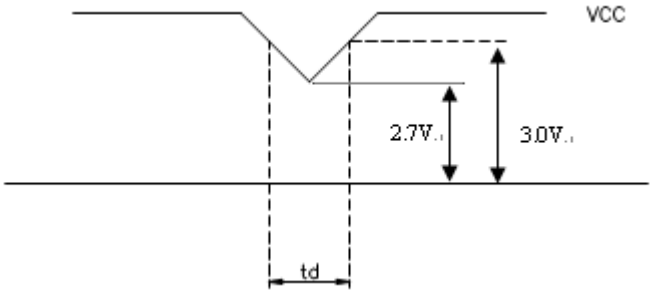
3.1 TFT LCD Power Voltage

Ta=25℃

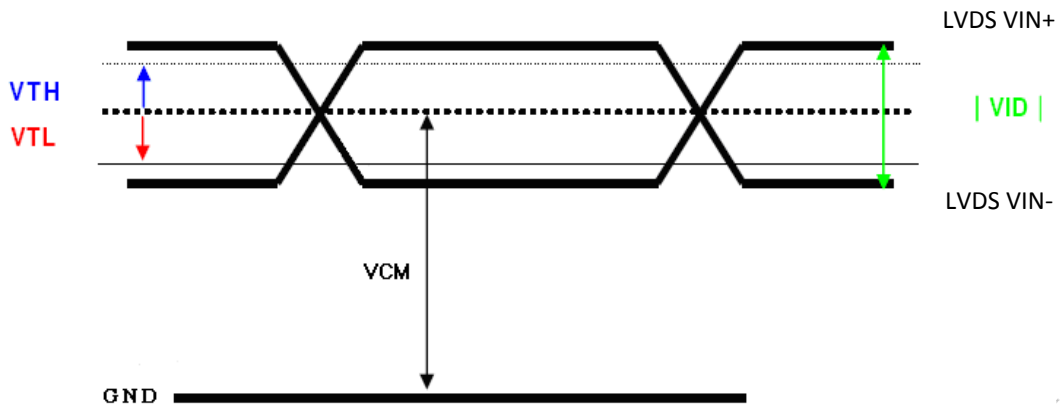
ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Digital Power Supply Voltage For LCD	DVDD	3	3.3	3.6	V	Note1
Logic Input Voltage (LVDS:IN+,IN-)	VCM	$\frlvert VID \frrvert / 2$	-	$2.4 - \frlvert VID \frrvert / 2$	V	Note2
	$\frlvert VID \frrvert$	200	-	600	mV	Note2
	VTH	-	-	100	mV	VCM=1.2V Note2
	VTL	-100	-	-	mV	
Analog Power Supply Voltage	AVDD	9.4	9.6	9.8	V	
Gate On Power Supply Voltage	VGH	19	20	21	V	
Gate Off Power Supply Voltage	VGL	-6.6	-6	-5.4	V	
Common Power Supply Voltage	VCOM	(3.5)	(4.0)	(4.5)	V	Note3
Gamma Voltage	V1	-	(9.128)	-	V	
	V2	-	(8.978)	-	V	
	V3	-	(7.297)	-	V	
	V4	-	(6.868)	-	V	
	V5	-	(6.561)	-	V	
	V6	-	(6.066)	-	V	
	V7	-	(5.303)	-	V	
	V8	-	(4.842)	-	V	
	V9	-	(3.641)	-	V	
	V10	-	(2.999)	-	V	
	V11	-	(2.653)	-	V	
	V12	-	(2.192)	-	V	
	V13	-	(0.589)	-	V	
	V14	-	(0.439)	-	V	

【Note1】 VCC –dip condition:

1) When 2.7 V≦VCC＜3.0V，td≦10ms.
2) VCC＞3.0V，VCC-dip condition should be same as VCC-turn-on condition.



【Note 2】LVDS signal

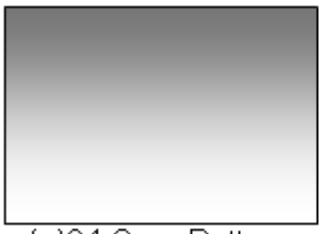


【Note 3】Please adjust VCOM to make the flicker level be minimum.

3.2 TFT-LCD Current Consumption

ITEM	SYMBOL	CONDITION	MIN	TYPE	MAX	UNIT	NOTE
Gate on power current	IVGH	VGH =20V	- -	0.5	1	mA	Note1
Gate off power current	IVGL	VGL= -6V	- -	0.5	1	mA	Note1
Digital power current	IDVDD	DVDD = 3.3V	- -	(40)	(50)	mA	Note1
Analog power current	IAVDD	AVDD = 9.6V	- -	(40)	(70)	mA	Note1
LCD Power Consumption	PC		- -	(530)	(860)	mW	Note1

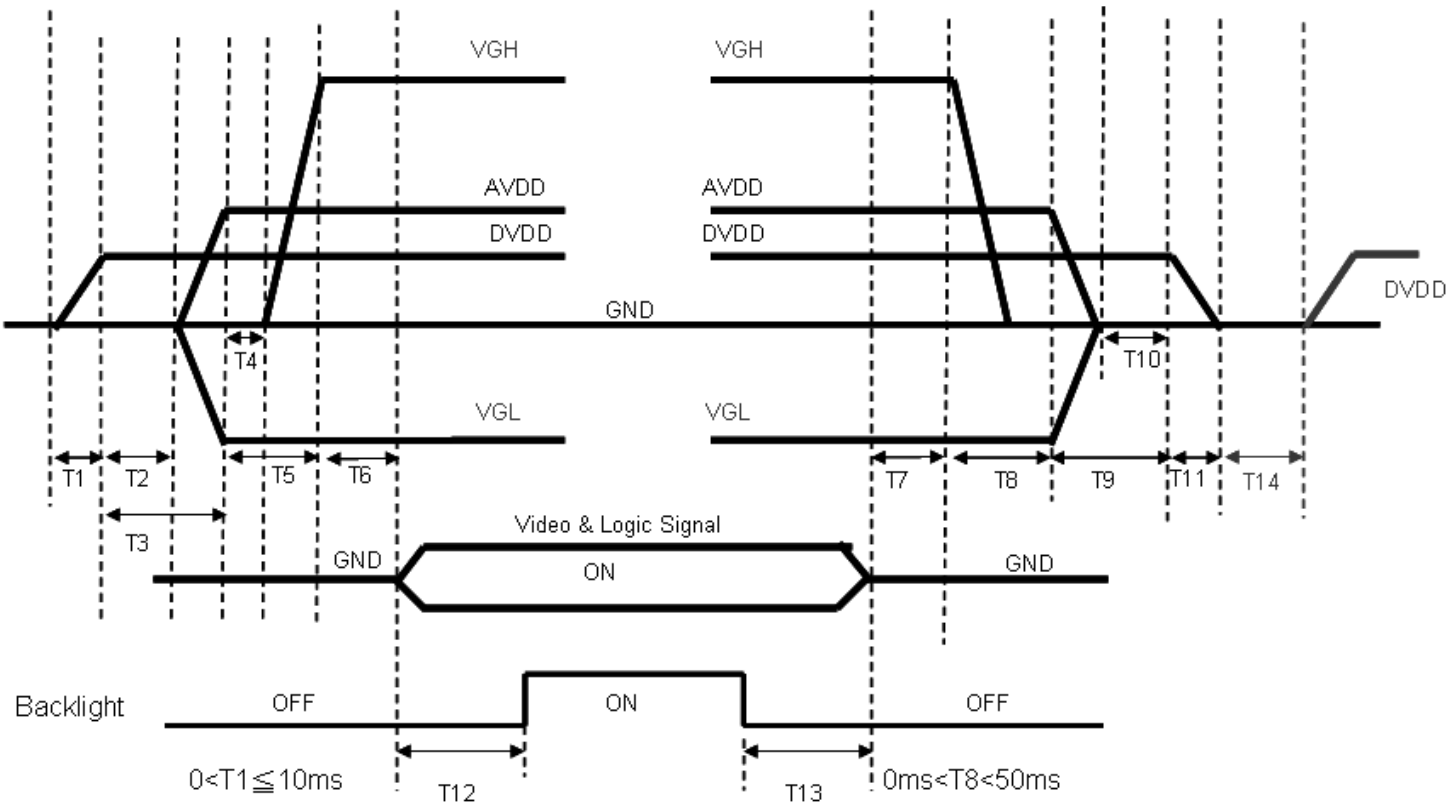
【Note1】（Frame rate = 60 Hz）
Typical: Under 64 gray pattern
Maximum: Under black pattern


(a)64 Gray Pattern


(b)Black Pattern

3.3 Power、Signal Sequence

Power On：DVDD→AVDD/VGL →VGH →Video &Logic Signal→Backlight
Power Off：Backlight→Video &Logic Signal→ VGH→AVDD/VGL→DVDD



0<T1≦10ms
T2>0ms
T3>20ms
T4>0ms
T5>10ms
0<T6≦10ms
0ms<T7<50ms
0ms<T8<50ms
T9>0ms
T10>0ms
0<T11≦10ms
T12≧200ms
T13≧200ms
T14 ≧200ms

4. INTERFACE CONNECTION

CN1：Connector type：MSBK2407P30D (STM) or compatible.

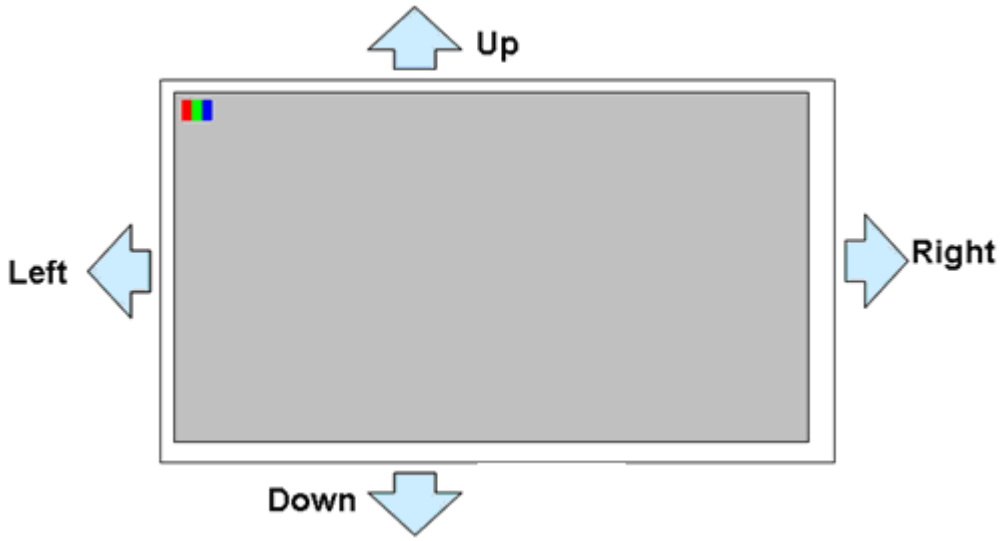
PIN NO	SYMBOL	DESCRIPTION
1	AGND	Analog ground
2	AVDD	Analog power
3	DVDD	Digital power
4	GND	Digital ground
5	VCOM	Common voltage
6	DVDD	Digital power
7	GND	Digital ground
8	V14	Gamma correction voltage reference
9	V13	Gamma correction voltage reference
10	V12	Gamma correction voltage reference
11	V11	Gamma correction voltage reference
12	V10	Gamma correction voltage reference
13	V9	Gamma correction voltage reference
14	V8	Gamma correction voltage reference
15	GND	Digital ground
16	DVDD	Digital power
17	GND	Digital ground
18	PIND3	Positive LVDS differential data input
19	NIND3	Negative LVDS differential data input
20	GND	Digital ground
21	PINC	Positive LVDS differential clock input
22	NINC	Negative LVDS differential clock input
23	GND	Digital ground
24	PIND2	Positive LVDS differential data input
25	NIND2	Negative LVDS differential data input
26	GND	Digital ground
27	PIND1	Positive LVDS differential data input
28	NIND1	Negative LVDS differential data input
29	GND	Digital ground
30	PIND0	Positive LVDS differential data input
31	NIND0	Negative LVDS differential data input
32	GND	Digital ground
33	GND	Digital ground
34	GRB	Global reset pin. Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high. (R=10KΩ，C=1μF)
35	STBYB	Standby mode, normally pull high STBYB=”1”, normal operation STBYB=”0”,timing control, source driver will turn off, all output are high-Z
36	SHLR	Left or right display control
37	DVDD	Digital power
38	UPDN	Up / down display control
39	AGND	Analog ground
40	AVDD	Analog power
41	VCOM	Common voltage
42	DITH	Dithering function enable control. Normally pull low DITHER = “1”, Enable internal dithering function DITHER = “0”, Disable internal dithering function
43	GND	Digital ground
44	DVDD	Digital Power
45	GND	Digital ground
46	V7	Gamma correction voltage reference
47	V6	Gamma correction voltage reference
48	V5	Gamma correction voltage reference
49	V4	Gamma correction voltage reference
50	V3	Gamma correction voltage reference
51	V2	Gamma correction voltage reference
52	V1	Gamma correction voltage reference

53	GND	Digital ground
54	DVDD	Digital power
55	SELB	6bit/8bit mode select, SELB = “0”, LVDS input data is 8bits SELB = “1”, LVDS input data is 6bits
56	VGH	Positive power for TFT
57	DVDD	Digital power for Gate IC
58	VGL	Negative power for TFT
59	GND	Digital ground for Gate IC
60	NC	Not connect

Remarks：

1) Mating connector：089K60-000100-G2-R (STARCONN)
2) UPDN and SHLR control function

UPDN	SHLR	FUNCTION
0	1	Normal display
0	0	Inverse Left and Right
1	1	Inverse Up and Down
1	0	Inverse Left and Right Inverse Up and Down



3) if LVDS input data is 6bits,SELB must must be set to High
if LVDS input data is 8bit , SELB must be set to Low

DITH and SELB control function

DITH	SELB	FUNCTION
0	1	Colors (262K)
0	0	Colors (262K)
1	1	Colors (262K)
1	0	Colors (16.7M)

CN2：BLU Pin assignment

PIN NO	SYMBOL	FUNCTION
1	A	Anode
2	K	Cathode

Note：
Input connector : BHSR-02VS-1(JST)
Outlet connector: SM02B-BHSS-1(JST)

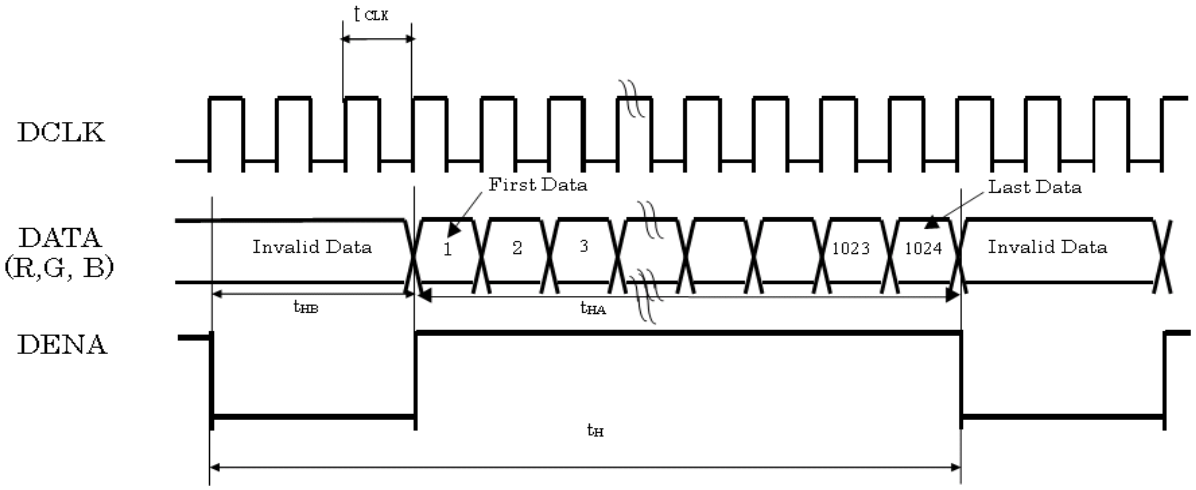
5. INPUT SIGNAL

5.1 Timing Specification

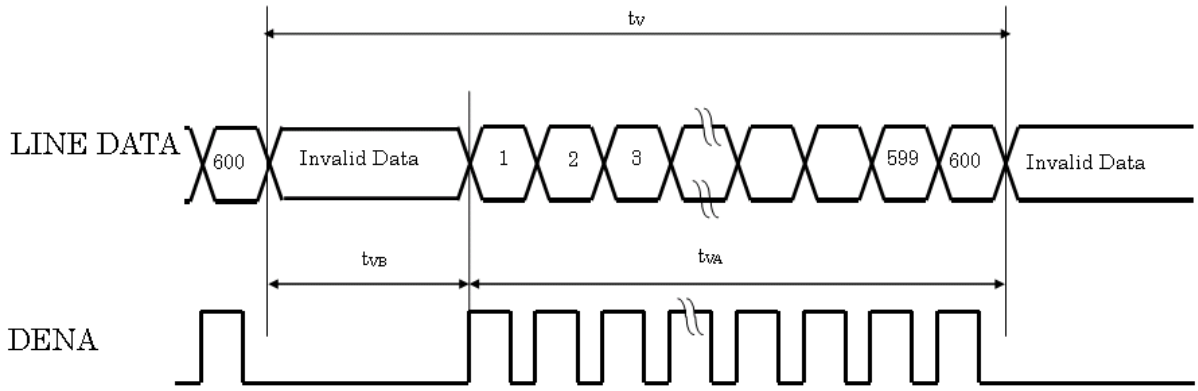
ITEM				SYMBOL	MIN.	TYP.	MAX.	UNIT
LVDS input signal sequence	CLK Frequency			tCLK	41	45	50	MHz
	CLK Period			tCLK	24.39	22.22	20.00	ns
LCD input timing	DENA	Horizontal	Horizontal Period	t_H	1194	1200	1240	tCLK
			Horizontal Valid	t_{HA}	1024	1024	1024	tCLK
			Horizontal Blank	t_{HB}	170	176	216	tCLK
		Vertical	Frame	fV	55	60	65	Hz
			Vertical Period	t_V	624	625	638	t_H
			Vertical Valid	t_{VA}	600	600	600	t_H
			Vertical Blank	t_{VB}	24	25	38	t_H

5.2 Timing Sequence (Timing Chart)

5.2.1 Horizontal Timing Sequence

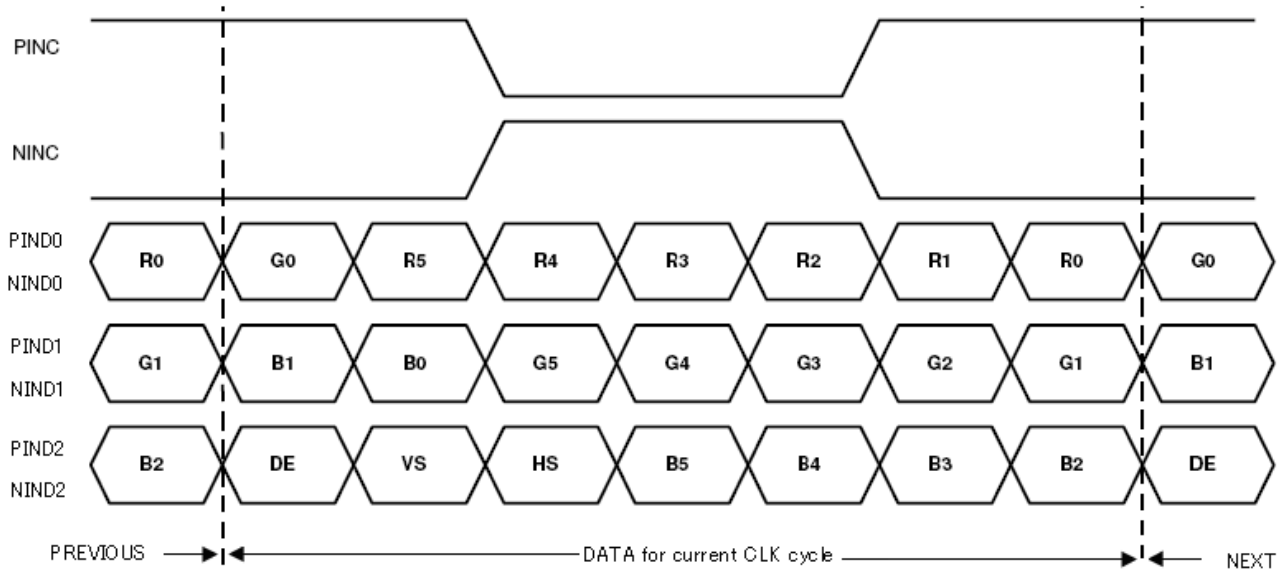


5.2.2 Vertical Timing Sequence

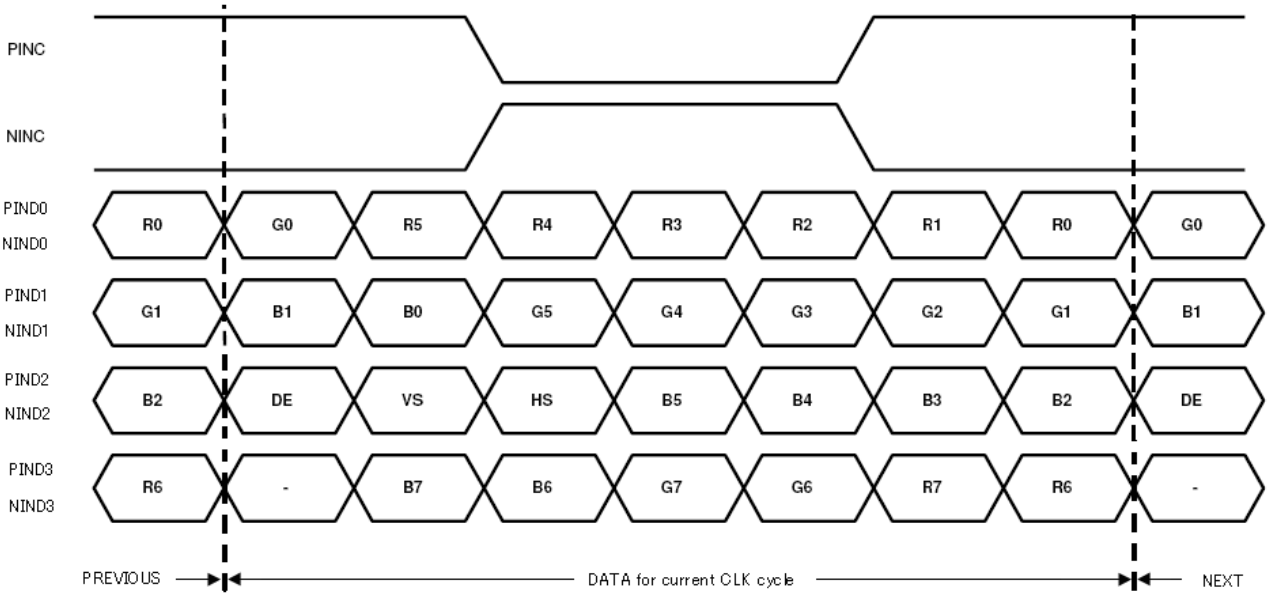


5.2.3 LVDS Input Data Mapping

6bits LVDS input



8bits LVDS input



5.3 Color Data Assignment

COLOR	INPUT DATA	R DATA						G DATA						B DATA					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
		MSB					LSB	MSB					LSB	MSB					LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
	GREEN(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	GREEN(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
BLUE	BLUE(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	BLUE(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	BLUE(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

【Note1】Definition of Gray Scale

color(n)：n is series of Gray Scale. The more n value is, the bright Gray Scale.

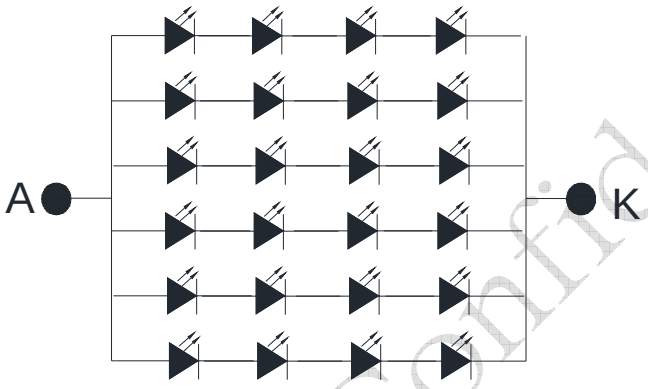
【Note2】Data:1-High,0-Low

5.4 Backlight unit

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
LED current	IL	Ta=25℃ IF=60mA	--	360	--	mA	
LED voltage	VL	Ta=25℃ IF=60mA		11.6		V	
Power consumption	WL	Ta=25℃ IF=60mA	--	4.176	--	W	
LED LifeTime		Ta=25℃ IF=60mA	50000	70000		Hr	

Note

*1)LED Circuit Diagram



*2) A：Anode(＋)，K：Cathode(－)

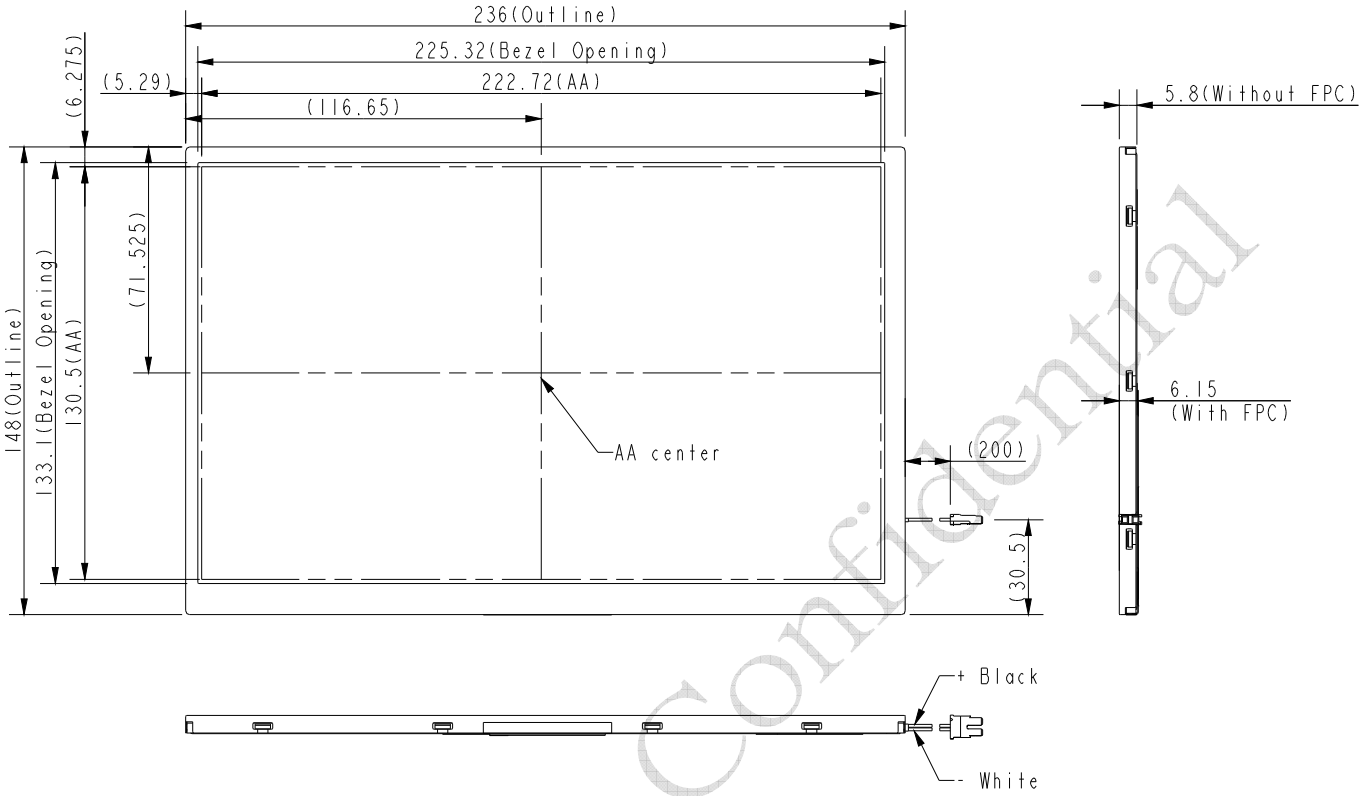
*3) LED control must use the constant current control to avoid the leakage light and brightness quality issue.

*4) Definition LED lifetime：Luminance will decay less than 50%.

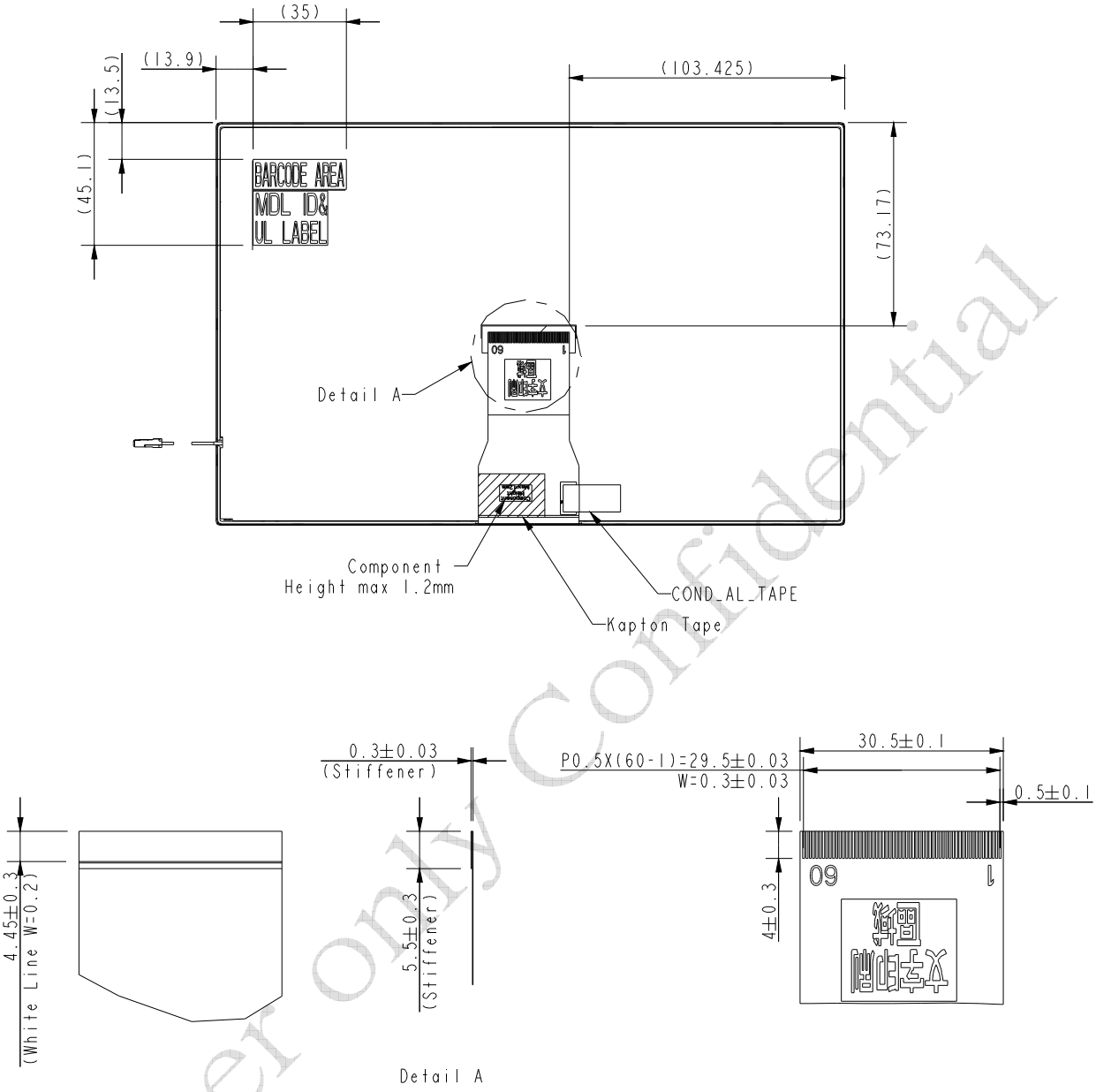
6. MECHANICAL DIMENSION

6.1 Front Side

[Unit：mm]



6.2 Rear Side



[Unit：mm]

[Note]：Tolerance is ±0.3mm

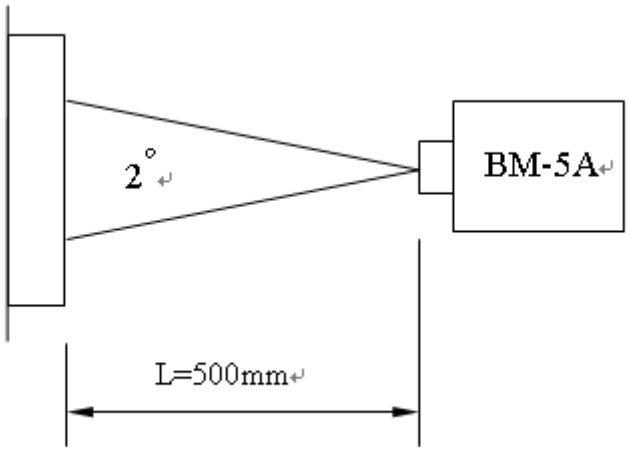
7. OPTICAL CHARACTERISTICS

Ta = 25℃, V_{CC} =3.3V

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Constrast Ratio		CR	Point-5	700	1000	--	--	*1)*2)*3)
Luminance*)		Lw	Point-5	-	600	--	cd/m^2	*1)*3)
NTSC		NTSC		60	70	--	%	*1)*3)
Luminance Uniformity		ΔL		70	80		%	*1)*3)
ResponseTime(White-Black)		Tr+Tf	Point-5	--	25	30	ms	*1)*3)*5)
Viewing Angle	Horizontal	Left (ψ)	CR≧10 Point-5	60	70	--	°	*1)*2)*4)
		Right (ψ)		60	70	--	°	*1)*2)*4)
	Vertical	Up (θ)		45	55	--	°	*1)*2)*4)
		Down (θ)		55	65	--	°	*1)*2)*4)
Color Coordinate	White	Wx Wy	θ=ϕ= 0° Point-5	(0.264) (0.295)	(0.304) (0.335)	(0.344) (0.375)	--	*1)*3)
	Red	Rx Ry		(0.615) (0.300)	(0.655) (0.340)	(0.695) (0.380)		
	Green	Gx Gy		(0.281) (0.592)	(0.321) (0.632)	(0.361) (0.672)		
	Blue	Bx By		(0.111) (0.022)	(0.151) (0.062)	(0.191) (0.102)		

NOTE :

*1)Measure condition：25℃±2℃，60±10%RH，under 1 Lux in the dark room color coordinate and color gamut are measured by SRUL1R,and all the other items are measured by BM-5A (TOPCON)，viewing angle2°，IL=360mA（Backlight current），measurement after lighting on 10 mins.



*2）Definition of contrast ratio：

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

3) Definition of luminance：Measure white luminance on the point 5 as figure8-1
Definition of Luminance Uniformity: Measure white luminance on the point1~9 as figure8-1
ΔL = [L(MIN)/L(MAX)]×100

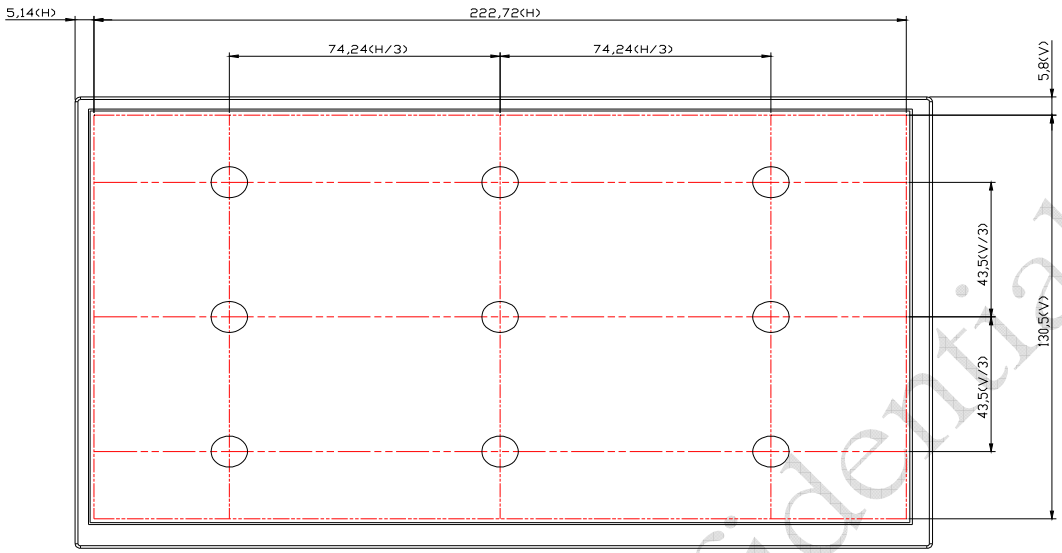


Fig8-1 Measuring point

*4) Definition of Viewing Angle(θ,ψ),refer to Fig8-2 as below：
These items are measured by EZ-CONTRAST (ELDIM) in the dark room. (no ambient light).

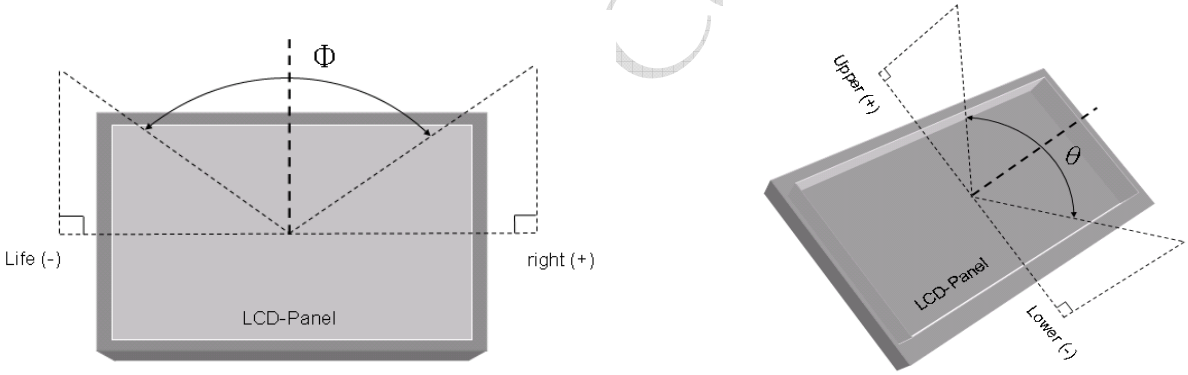


Fig8-2 Definition of Viewing Angle

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

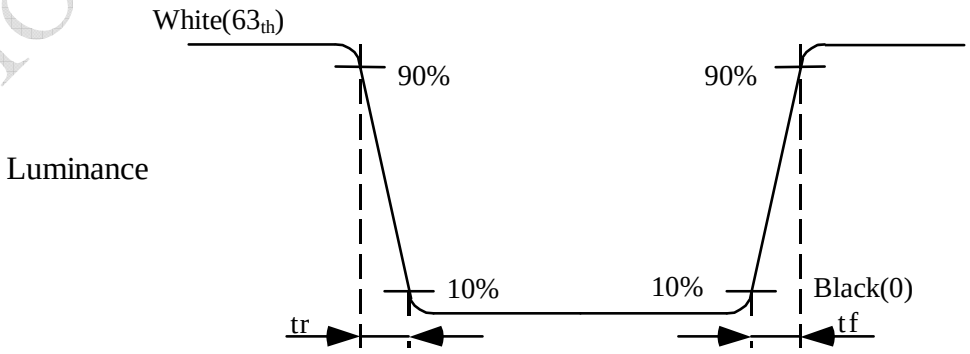


Fig8-3 Definition of Response Time(White-Black)

8. RELIABILITY TEST

8.1 Temperature and Humidity

TEST ITEMS	CONDITIONS	NOTE
High Temperature Operation	85℃，240Hrs	
High Temperature Storage	90℃，240Hrs	
High Temperature High Humidity Operation	60℃，90%RH，240Hrs	No condensation
Low Temperature Operation	-30℃，240Hrs	
Low Temperature Storage	-40℃，240Hrs	
Thermal Shock	-40℃（0.5Hr）~ 85℃(0.5Hr) 200 cycles	
Image Sticking	25℃,4hrs,8*6 Chess board,5min Disappear	Note1

【Note1】
Condition of Image Sticking test：25 ℃± 2 ℃
Operation with test pattern sustained for 4 hrs, then change to gray pattern immediately.
After 5 mins, the mura must be disappeared completely.

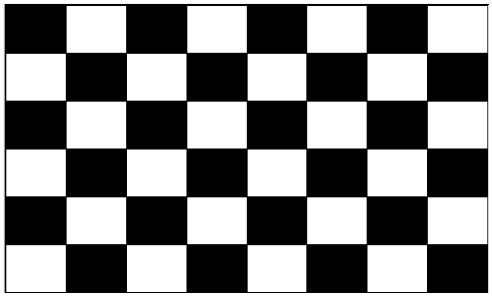


Image Sticking pattern


Judegment pattern 128-Gray

8.2 Shock and Vibration

TEST ITEMS	CONDITIONS
Shock (Non-operation)	● Shock level:980m/s^2(equel to 100G) ● Waveform:half sinusoidal wave,6ms. ● Number of shocks: ±X，±Y，±Z，each axis 1times, total 6 times
Vibration (Non-operation)	● Frequency range:8~33.3Hz ● Stroke:1.3mm ● Vibration:sinusodial wave,perpendicularaxis(both x, z axis:2Hrs, y axis 4Hrs). ● Sweep:2.9G,33.3Hz-400Hz ● Cycle:15min

8.3 ESD Test

ITEM	CONDITION	NOTE
ESD	150pF，330Ω，±8KV&±15KV air & contact test	*1)
	200pF，0Ω，±200V contact test	*2)

NOTE:
*1) LCD glass and metal bezel
*2) IF connector pins

8.4 Judgment Standard

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

Pass: Normal display image with no line defect.

Fail: No display image, function NG or line defects.

9. WARRANTY

9.1 The period is within 12 months since the date of shipping out under normal using and storage conditions. (25°C±5°C; <60%RH)

9.2 The warranty will be avoided in case of defect induced by customer.