Chunghwa Picture Tubes, Ltd.
Product Specification

To ：上海汽車
Date : 20150310

TFT LCD
CLAA104EA01 XN

ACCEPTED BY : (V0.1)
Only For customer Reference

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REVISION STATUS

Revision Notice	Description	Page	Rev. Date
0.0	First version	---	2015/02/04
0.1	NC	10	2015/02/16

CONTENTS

1. OVERVIEW

CLAA104EA01 XN is 10.4” color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs ,control circuit and LED backlight. By applying 960(H) × 3 (RGB) × 1280(V)× images are displayed on the 10.4” diagonal screen. Display 16.7M colors by R.G.B signal input.

General specification are summarized in the following table:

ITEM	SPECIFICATION
Display Area (mm)	158.4(H) x 211.2(V)
Number of Pixels	960(H) × 3 (RGB) × 1280(V)
Pixel Pitch (mm)	0.165x0.165mm
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally Black
Number of Colors	16.7M (Real 8 bit)
Brightness (cd/m^2)	650nit (min)
Response Time (ms)	25℃ ：25ms(typ) / 30ms(max)
Response Time -20℃	Tr+ Tf : 400ms(max) ，
Response Time -30℃	Tr+ Tf : 700 ms(max.)
Contrast Ratio	800:1(Min) /1000:1(Typ)
Viewing Angle (CR≧10)	170degree (Horizontal)
	170degree (Vertical)
Power Consumption (W)	TBD
Interface connection	LVDS
Module Size (mm)	173.4 x 228.7 x 9.0(W/O Heat Sink) 173.4 x 228.7 x 13.9 (W/ Heat Sink)
Module Weight (g)	TBD
Backlight Unit	LED
Surface Treatment	Anti-Glare 25% , 3H
Reflectivity	<4.5% base on SCI at 8°

2. ABSOLUTE MAXIMUM RATINGS

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

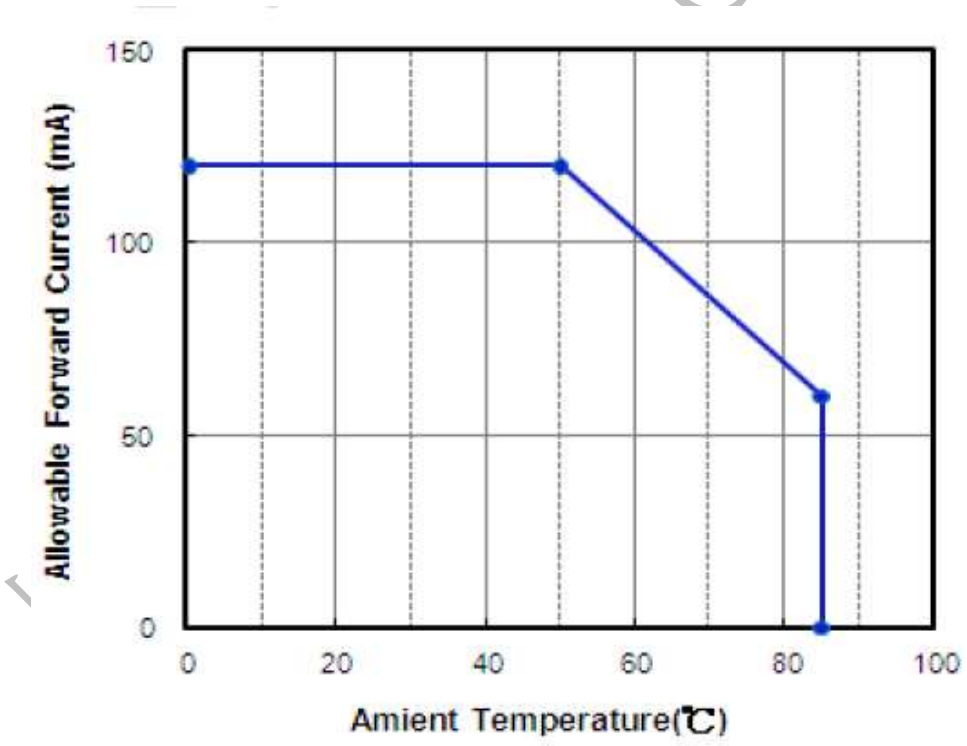
Item	Symbol	Min.	Max.	Unit	Note
Digital Supply Voltage	DVDD DVDD_LVDS	-0.3	3.96	V	
Analog Supply Voltage Positive	AVDDP	-0.3	6.5	V	
Analog Supply Voltage Negative	AVDDN	-6.5	0.3	V	
Gate On Voltage	VGH	-0.3	42	V	
Gate Off Voltage	VGL	-25	0.3	V	
Gate On-Gate Off Voltage	VGH-VGL	12	40	V	
Signal Input Voltage	NIND0 ~ NIND3 PIND0 ~ PIND3 NINC,PINC	-0.3	DVDD+0.3	V	
Forward Current （per LED）	If	-	120	mA	
Pulse forward current（per LED）	Ifp	-	240	mA	1、2、3
Operating temperature	Topa	-40	85	℃	4.5
Storage temperature	Tstg	-40	90	℃	4

Note：

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



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

(5) -40度，Functiion ok

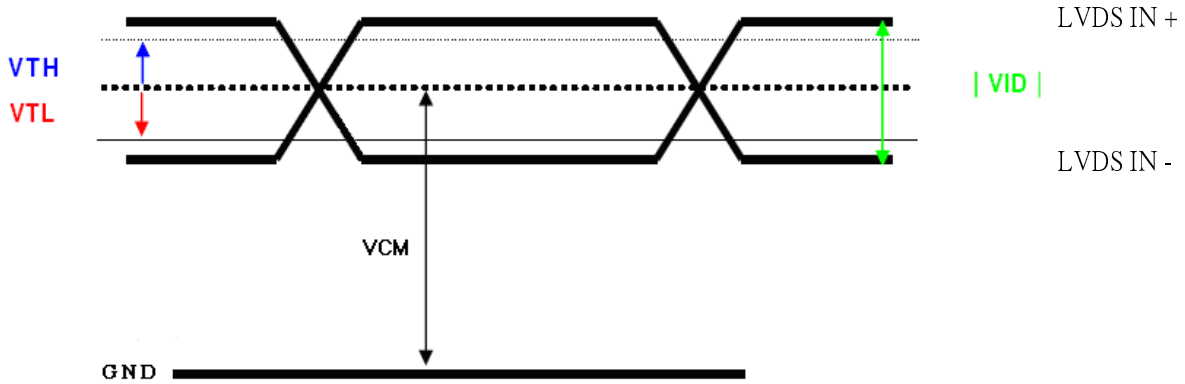
3. ELECTRICAL CHARACTERISTICS

3.1 TFT LCD

Ta=25℃

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
Digital Power Supply Voltage For LCD	DVDD	3	3.3	3.6	V	
Logic Input Voltage (LVDS:IN+,IN-)	VCM	1	1.2	$1{,}7-\frac{\lvert VID\rvert}{2}$	V	Note1
	$\lvert VID\rvert$	200	-	600	mV	Note1
	VTH	100	-	300	mV	VCM=1.2V Note1
	VTL	-300	-	-100	mV	
Analog Supply Voltage Positive	AVDDP		6		V	
Analog Supply Voltage Negtive	AVDDN		-6			
Gate On Power Supply Voltage	VGH	17	18	19	V	
Gate Off Power Supply Voltage	VGL	-12.6	-12	-11.4	V	
Logic Input Voltage	VIH	0.7*DVDD	-	DVDD	V	
	VIL	GND	-	0.3*DVDD	V	

Note1：LVDS signal



【Recommend】VCOM must be optimized according to each LCM. Please adjust VR to make the flicker level be minimum for getting excellent image.

3.2 TFT-LCD Current Consumption

Item	Symbol	Condition	Min.	Typ.	Max.	Unit.	Note.
Gate on Current	IVGH	VGH =18V	-	TBD		mA	【Note1】
Gate off Current	IVGL	VGL= -12V	-	TBD		mA	【Note1】
Digital Current	IDVDD	DVDD = 3.3V	-	TBD		mA	【Note1】
Analog Current Positive	IAVDD	AVDDP = 6	-	TBD		mA	【Note1】
Analog Current Negtive	IAVDDP	AVDDN = -6	-	TBD		mA	【Note1】
Total Power Consumption	PC		-	TBD		mW	【Note1】

【Note】

Note1: Typical: Under 256 gray pattern

Maximum: Under white pattern

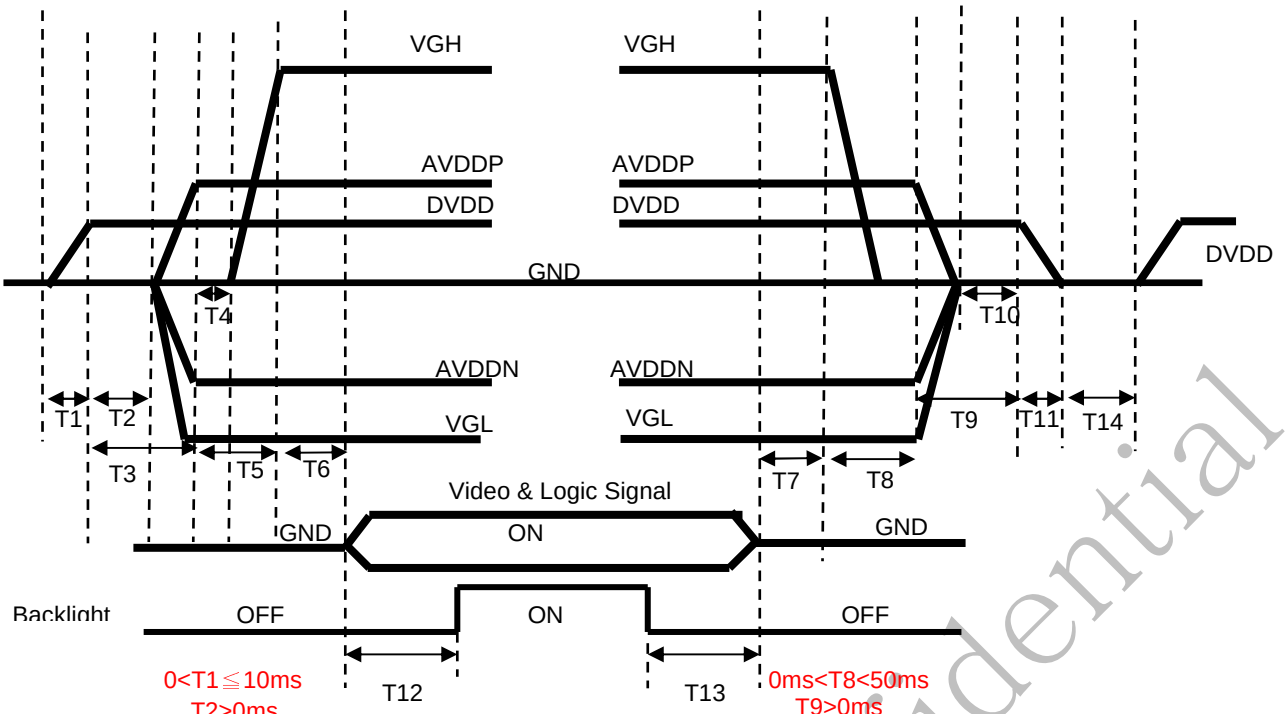
256 gray pattern

white Pattern

3.3 Power and Signal sequence

Power On：DVDD→AVDDP/AVDDN/VGL →VGH →Video &Logic Signal→Backlight

Power Off：Backlight→Video &Logic Signal→ VGH →AVDDP/AVDDN/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

3.4 Backlight

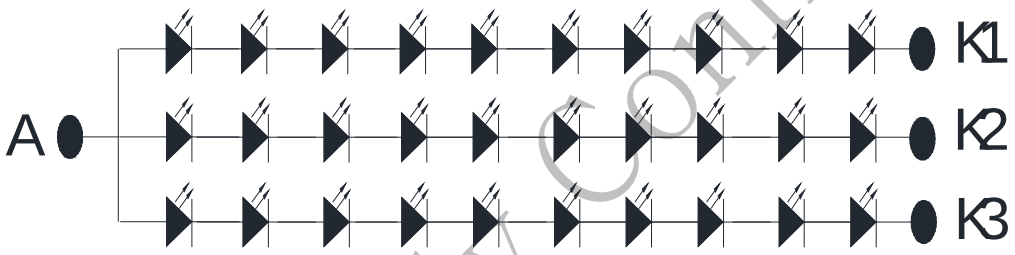
Base on 7S4P

Ta=25℃

ITEM	SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
LED current	IL	Ta=25℃ (120mA/serise)	--	360	--	mA	LED current
LED voltage	VL	Ta=25℃ (120mA/serise)		31		V	LED voltage
Power consumption	WL	Ta=25℃ (120mA/serise)		11.16		W	Power consumption
LED Lifetime	-	Ta=25℃ IF=120mA	10000			Hr	LED Lifetime
LED Lifetime	-	Ta=85℃ IF=120mA	1000			Hr	LED Lifetime

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 70%.

4. INTERFACE CONNECTION

4.1 CN1 (Input Signal)

Connector : FH52-60S-0.5SH (HRS)

Pin NO.	Symbol	Description
1	NC	Not Connect
2	NC	Not Connect
3	AGND	Analog ground
4	NC	Not Connect
5	AVDDP	Analog power +6V(typ)
6	AVDDP	Analog power +6V(typ)
7	NC	Not Connect
8	AVDDN	Analog power -6V(typ)
9	AVDDN	Analog power -6V(typ)
10	NC	Not Connect
11	DVDD	Digital power +3.3V(typ)
12	DVDD	Digital power +3.3V(typ)
13	NC	Not Connect
14	GND	Digital ground
15	GND	Digital ground
16	GND	Digital ground
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=47KΩ，C=0.1μF)
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	RL	Left or right display control
37	DVDD	Digital power +3.3V(typ)
38	TB	Up / down display control
39	NC	For Test, Please Keep it floating
40	NC	For Test, Please Keep it floating
41	NC	For Test, Please Keep it floating
42	AGND	Analog ground
43	NC	Not Connect
44	AVDDP	Analog power +6V(typ)
45	AVDDP	Analog power +6V(typ)
46	NC	Not Connect
47	AVDDN	Analog power -6V(typ)
48	AVDDN	Analog power -6V(typ)
49	NC	Not Connect
50	GND	Digital ground
51	GND	Digital ground

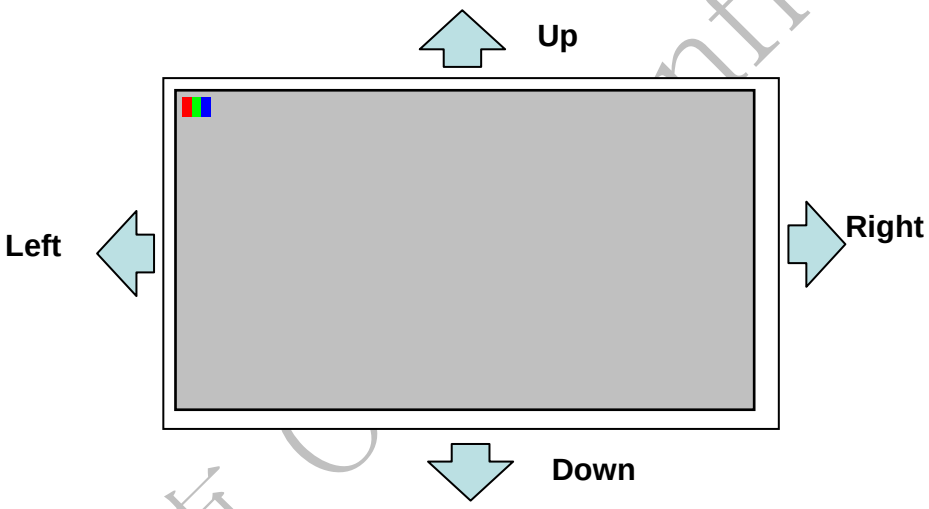
51 41 31 21 11

52	GND	Digital ground
53	NC	Not Connect
54	DVDD	Digital power +3.3V(typ)
55	NC	Not Connect
56	VGH	Positive power for TFT +18V(typ)
57	NC	Not Connect
58	VGL	Negative power for TFT -12V(typ)
59	NC	Not Connect
60	GND	Digital ground

1

Note 1：RL and TB control function

RL	TB	Data shifting
DVDD	GND	Left→Right，Up→Down(default)
GND	GND	Right→Left，Up→Down
DVDD	DVDD	Left→Right，Down→Up
GND	DVDD	Right→Left，Down→Up



4.2 CN2 (LED backlight)

Modify by the first version SPEC and NTC :Murata (NCP18XH103F0SRB)

Pin No.	Symbol	Function
1	A	Anode
2	A	Anode
3	A	Anode
4	Dummy	NC
5	K1	Cathode 1
6	K2	Cathode 2
7	K3	Cathode 3
8	Dummy	NC
9	NTC_A	NTC_Anode
10	NTC_K	NTC_Cathode

Note-1：Inverter side connector : FH52-10S-0.5SH (HRS)

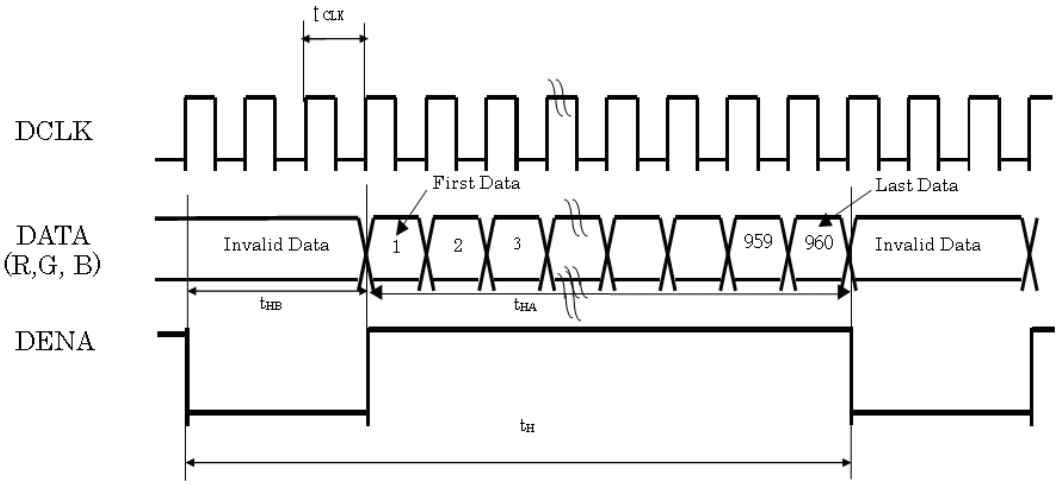
5. INPUT SIGNAL(DE ONLY MODE)

5.1 Timing Specification

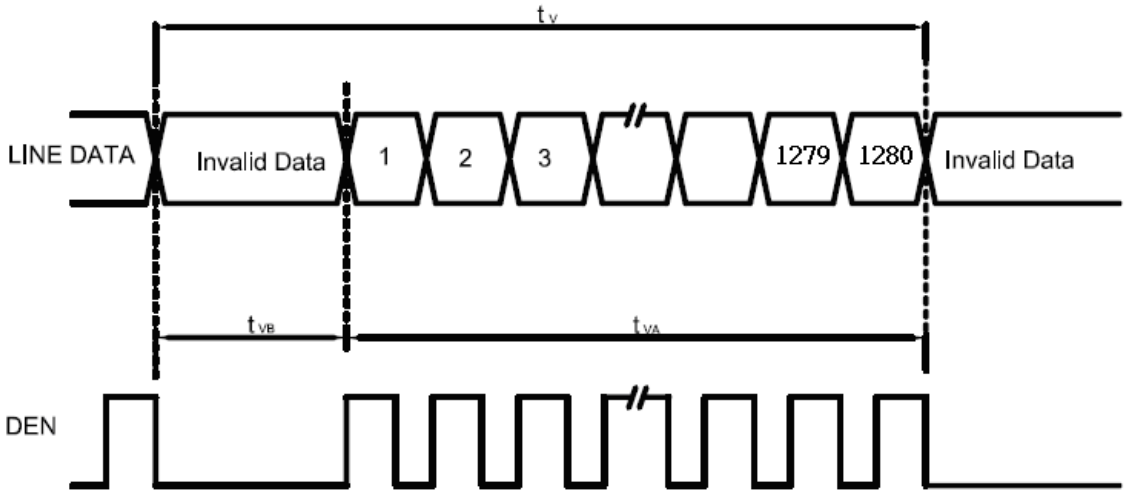
Item				Symbol	Min.	Typ.	Max.	Unit
LVDS input signal sequence	CLK Frequency			tclk	(70.4)	78.4	(83.2)	MHz
LCD input signal sequence （Input LVDS Transmitter）	DENA	Horizontal	(984)	990	(1004)	990	1004	tCLK
			Horizontal effective Time	t_{HA}	960			tCLK
			Horizontal Blank Time	t_{HB}	(24)	30	(44)	tCLK
		Vertical	Vertical total Time	t_V	(1300)	1320	(1380)	t_H
			Vertical effective Time	t_{VA}	1280			t_H
			Vertical Blank Time	t_{VB}	(20)	40	(100)	t_H

5.2 Timing sequence(Timing chart)

5.2.1 Horizontal Timing Sequence



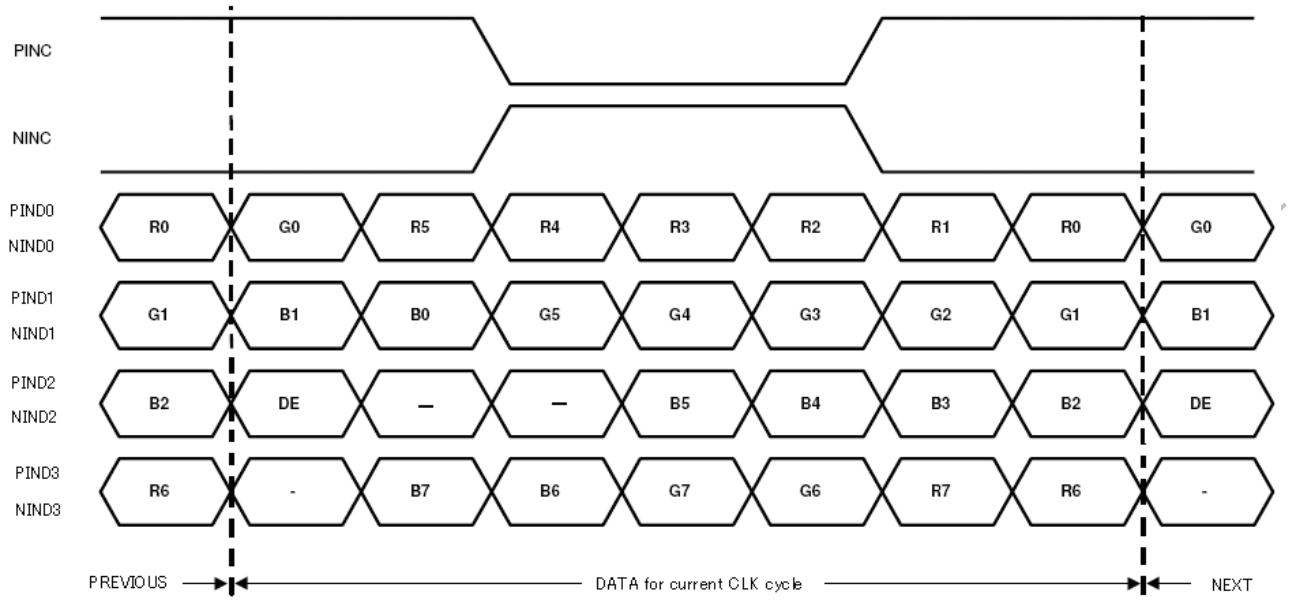
5.2.2 Vertical Timing Sequence



5.2.3 LVDS Input Data mapping

8 Bit LVDS input

Modify by the first version SPEC



5.2.4 Color Data Reference

Modify by the first version SPEC

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	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	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	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	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	0	0	0	0	0	0
	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	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	0	0	0	0	0	0
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	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	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	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	0	0	0	0	0	0	1	0
	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

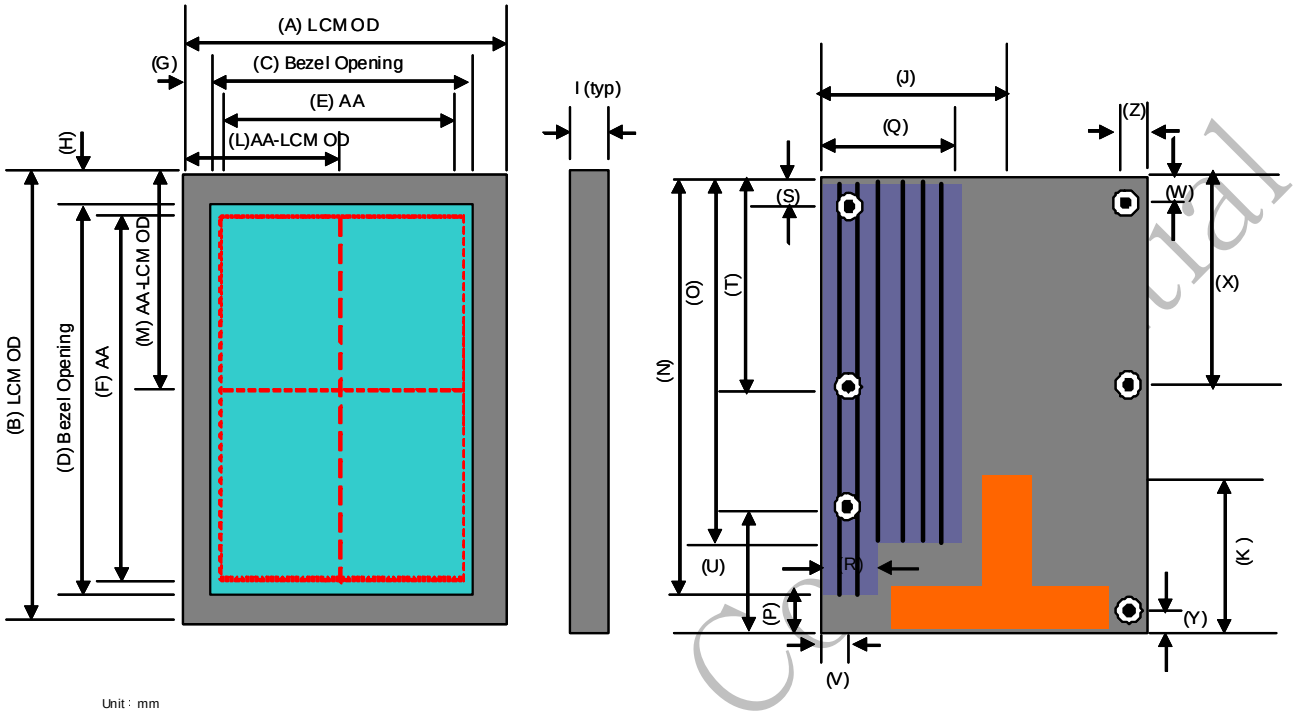
【Note】

1) Gray level:
   Color(n)：n is level order; higher n means brighter level.
2) DATA:
   1: high，0: low

6. MECHANICAL DIMENSION

6.1 Front Side

Modify by the first version SPEC



Unit : mm

(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I) (不含鍍片/含鍍片)	(J)	(K)	(L)	(M)	(N)	(O)	(P)	(Q)	(R)
173.4	228.7	161.4	214.2	158.4	211.2	3.975	4.95	9/13.9	(TBD) 依客戶需求	(TBD) 依客戶需求	84.675	112.05	(212)	(180)	(15)	(60)	(30)
(S)	(T)	(U)	(V)	(W)	(X)	(Y)	(Z)										
(12)	(114.35)	(25)	(12) 3個螺柱	(12)	(114.35)	(12)	(12) 3個螺柱										

NOTE: General tolerance=±0.3mm

NOTE: General tolerance=±0.3mm

6.2 Rear Side

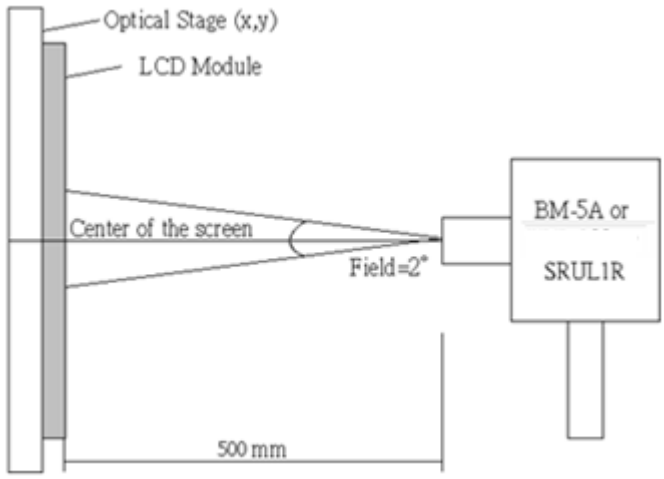
(Unit： mm)

7. OPTICAL CHARACTERISTICS

Ta = 25℃, VCC=3.3V

ITEM		SYMBOL	CONDITIONS	MIN	TYP	MAX	UNIT	NOTE
Constrast Ratio		CR	Point-5	800	1000		--	1, 2, 3
Luminance(CEN)		Lw	Point-5	650	-		cd/m^2	1, 3
Luminance Uniformity		ΔL		80	-		%	1, 3
Response Time (White - Black)		Tr +Tf	Point-5	-	25	30	ms	1, 3, 5
NTSC		-	Point-5		70	-	%	1, 4
Viewing Angle	Vertical	Upper(θ)	CR≧10 Point-5	75	85	--	°	1, 4
		Down(θ)		75	85			
	Horizontal	Left(ψ)		75	85	--	°	1, 4
		Right(ψ)		75	85			
Color Coordinate	White	Wx Wy	Point-5	(0.2873) (0.2987)	(0.3173) (0.3197)	(0.3473) (0.3497)	--	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，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=320mA（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.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

Note 4: Definition of Viewing Angle(θ,ψ),refer to Fig.7-2 as below：

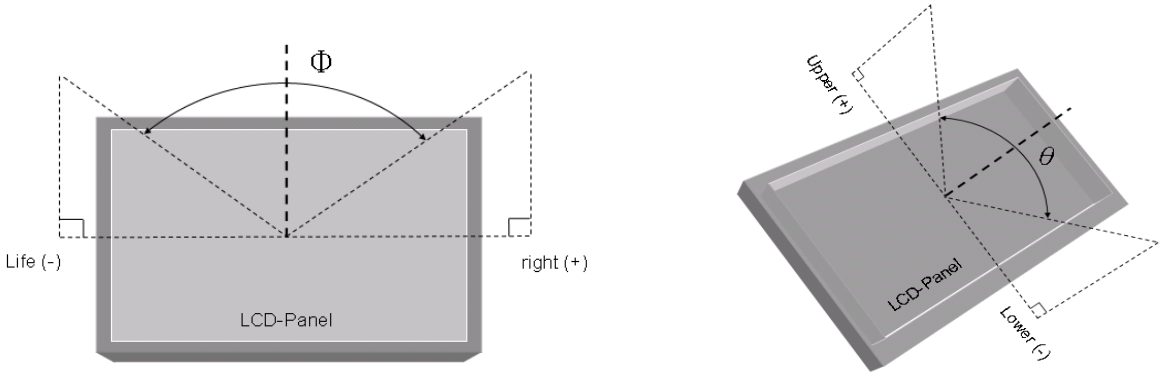


Fig.7-2 Definition of Viewing Angle

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

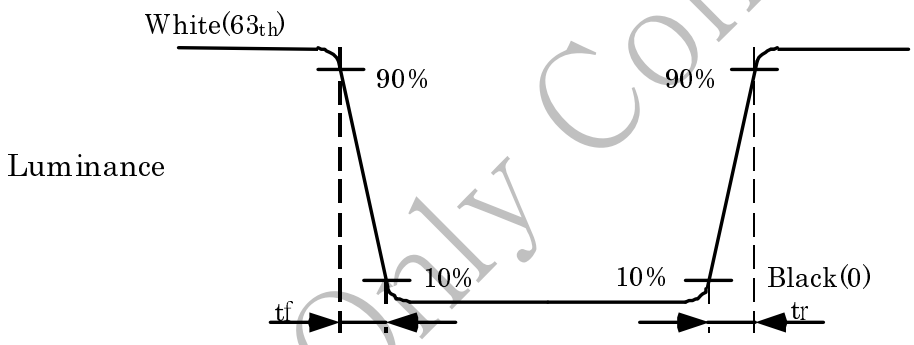


Fig.7-3 Definition of Response Time(White-Black)

8. RELIABILITY TEST

8.1. Temperature and humidity

TEST ITEMS	CONDITIONS	NOTE
High Temperature Operation	85°C ; 504hrs	
High Temperature Storage	90°C ; 504hrs	
High Temperature High Humidity Operation	60℃ ; 90% ; 504hrs	No condensation
Low Temperature Operation	-40°C ; 504hrs	Function only
Low Temperature Storage	-40°C ; 504hrs	
Thermal Shock	–40℃(0.5hr) ~ 85℃(0.5hr) ; 300 Cycles	
Image Sticking	25 ℃± 2 ℃ ; 2hrs	Note 1

Note 1.：

Condition of Image Sticking test：25 ℃± 2 ℃

Operation with test pattern sustained for 2 hrs, then change to gray pattern immediately.

After 5 mins, the mura must be disappeared completely .

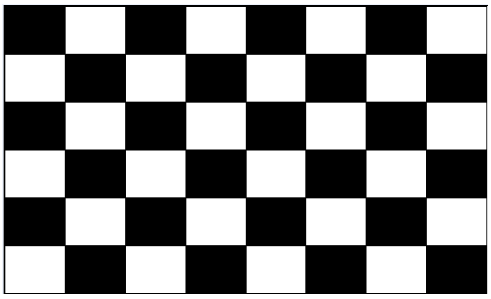


Image Sticking –pattern

Mid-Gray pattern

8.2. Shock and Vibration

TEST ITEMS	CONDITIONS
Shock (Non-operation)	● Shock level: 980m/s2(equal to 100G). ● Waveform: half sinusoidal wave,6ms. ● Number of shocks: +X,+Y,+Z each axis 3 times
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

8.3 Electrostatic Discharge

TEST ITEM	CONDITIONS	Note
ESD (Power On)	330pF、2KΩ、10 polarity / point / 3s Contact discharge： ±4Kv (Class B) ±8Kv (Class B) ±15Kv (Class C)	1
	330pF、2KΩ、10 polarity / point / 3s Air discharge： ±6Kv (Class B) ±15Kv (Class C)	1
ESD (Power Off)	330pF、2KΩ、 Air discharge、±25Kv	1

Note: Measure

1: LCD glass and metal bezel

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 defects.

9. WARRANTY

9.1 The period is within 12 months since the date of shipping out under normal using and storage conditions.

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