Chunghwa Picture Tubes, Ltd.
Technical Specification

To :

Date :

CPT TFT-LCD

CLAA101WP01

ACCEPTED BY：

APPROVED BY	CHECKED BY	PREPARED BY
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Doc. No:	**CLAA101WP01—SPEC-tentative-20111114**	Issue Date:	

Modification Record List

NO.	Issue Date	Modification Index
1	2011/03/11	First Edition
2	2011/06/03	ES2 LVDS 6 bit + VCOM compensation circuit
3		
4		
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1. OVERVIEW

CLAA101WP01 is 10.1" color (16：10) TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, LVDS driver ICs, control circuit and backlight. By applying 6 bit digital data, 1280×RGB (3) ×800, 262K-color images are displayed on the 10.1" diagonal screen. General specifications are summarized in the following table：

ITEM	SPECIFICATION
Display Area	216.96 (H) x 135.6 (V) (mm) (10.1-inch diagonal)
Number of Pixels	1280(H) × 3(RGB) × 800(V)
Pixel Pitch	0.1695 (H) × 0.1695 (V) (mm)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	HFFS
Number of Colors	262,144(6bits)(LVDS)
Gamut	50% (Typ)
Optimum Viewing Angle	6 o'clock
Response Time	30ms (Typ)
Surface Treatment	HC-LR
Viewing Angle	80°、80° / 80°、80° (Min) 85°、85° /85°、85° (Typ.)
Brightness	400 cd/m^2 (5 Point) (Typ)
Uniformity	9point：80%(min) 85%(Typ)
Consumption of Power	3.86W (Max)
Module Size	229.96(W)×149.7 (H)×3.1 (D) (mm) (Max) (w/o pcb) 229.96(W)×149.7 (H)×5 (D) (mm) (Max) (with pcb)
Module Weight	160g (Max)

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

Standard：Computer, Office equipment, Communication equipment, Test and Measurement equipment, Machine tool, Industrial robot, Audio and Visual equipment, Other consumer products.

2. ABSOLUTE MAXIMUM RATINGS

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

ITEM	SYMBOL	MIN	MAX	UNIT	NOTE
LCD Power Voltage	VCC	0	4.0	V	
LED Driver Input Voltage	VBL+	0	25	V	
Operation Temperature	Top	0	50	℃	*1).*2).*3).*4)
Storage Temperature	Tstg	-25	65	℃	*1).*2).*3)

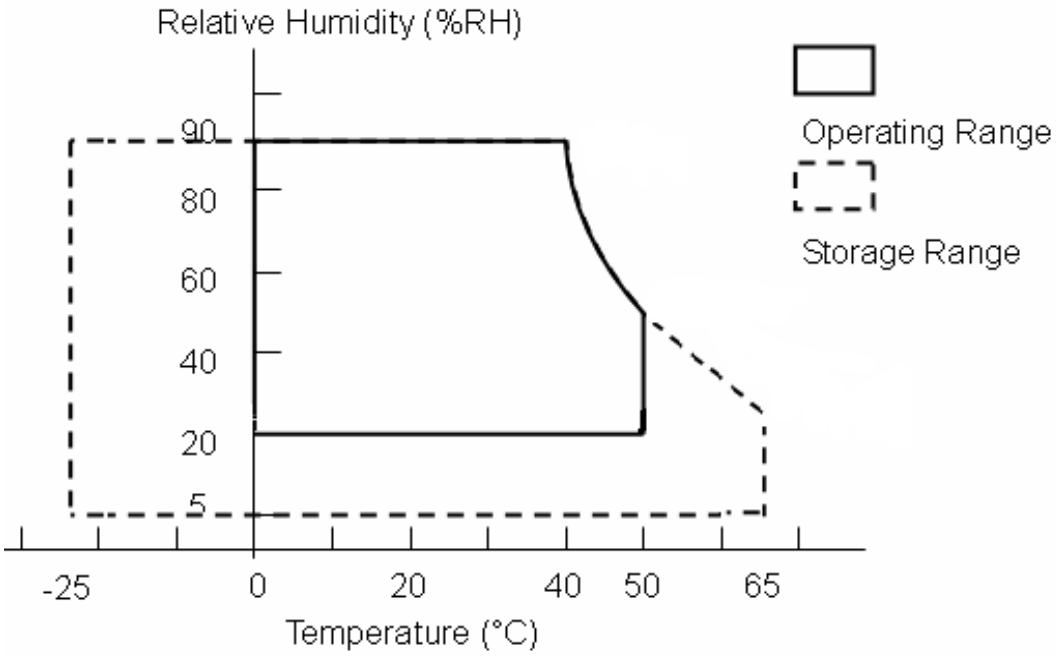
【Note】

*1) The relative temperature and humidity range are as below sketch, 90%RH Max. (Ta≦40℃)

*2) The maximum wet bulb temperature ≦39℃(Ta＞40℃) and without dewing.

*3) If product in environment which over the definition of the relative temperature and humidity out of range too long, it will affect visual of LCD.

*4) If you operate LCD in normal temperature range, the center surface of panel should be under 50℃.



3. ELECTRICAL CHARACTERISTICS

(A) TFT LCD

ITEM		SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Power Voltage		VCC	3.0	3.3	3.6	V	*1)
LCD Power Current		ICC	-	272		mA	*2)
Rush Current		Irush	-	(TBD)	-	A	*4)
Logic Input Voltage (LVDS: IN+,IN-)	Common Voltage	VCM	|VID|/2		2.4-(|VID|/2)	V	*3)
	Differential Input Voltage	|VID|	200		600	mV	*3)
	Threshold Voltage (HIGH)	VTH	-	-	100	mV	*3) When VCM = +1.2V
	Threshold Voltage (LOW)	VTL	-100	-	-	mV	

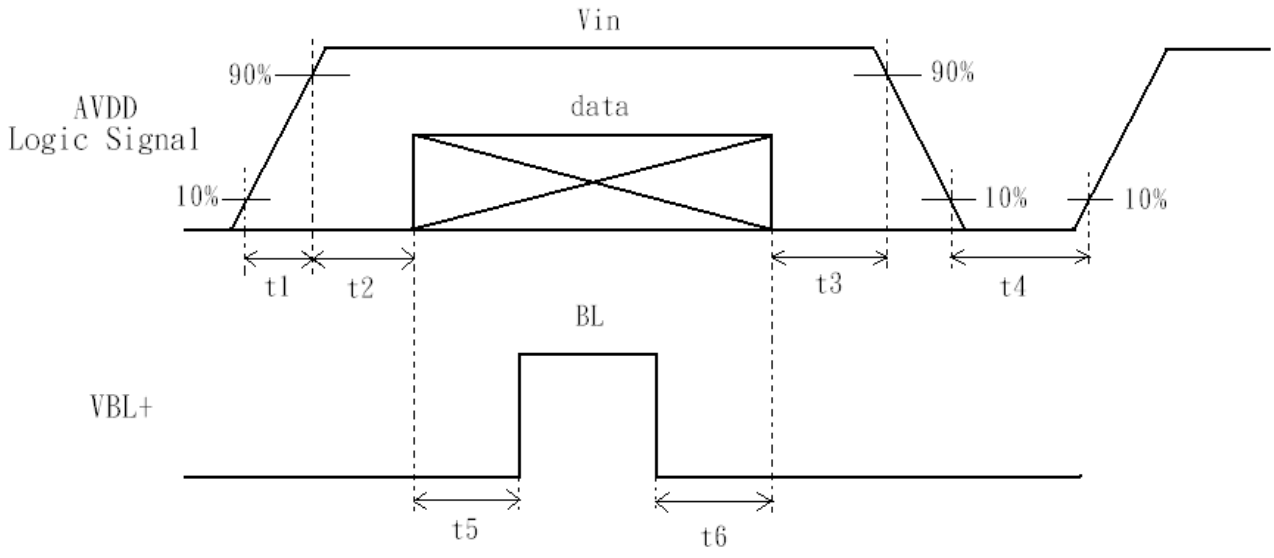
【Note】

*1) Power Sequence：

0.50 ms≦t1 ≦10 ms　　500 ms≦t4

0.01 ms＜t2 ≦50 ms　　200 ms≦t5

0.01 ms＜t3 ≦50 ms　　200 ms≦t6

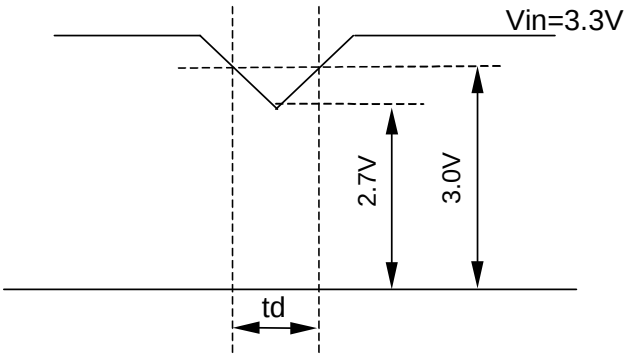


data:RGB DATA, DCLK, HD, VD, DENA

VCC-dip state

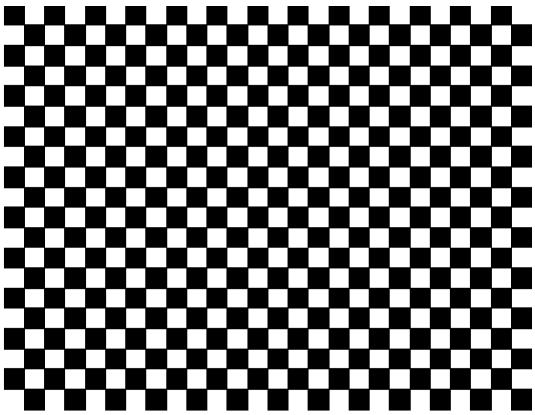
(1)when 3.0V＞VCC≧2.7V，td≦10 ms.

(2)when VCC＜2.7V，VCC-dip condition should as the VCC-turn-off condition.



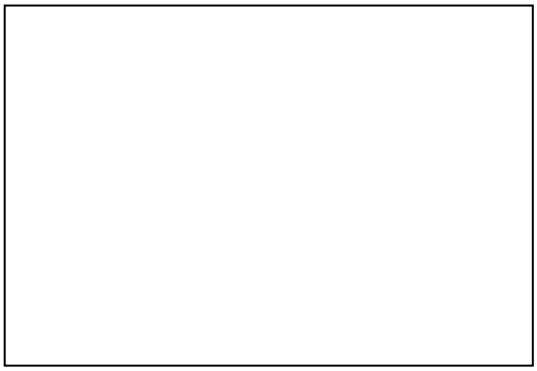
*2) Typical value is Mosaic (32*36 Checker board) Pattern：800 line mode.

Circuit condition (Typ)：VCC=3.3 V，f_V=60 Hz，f_H=49.375 kHz，f_{CLK}=71.1 MHz.

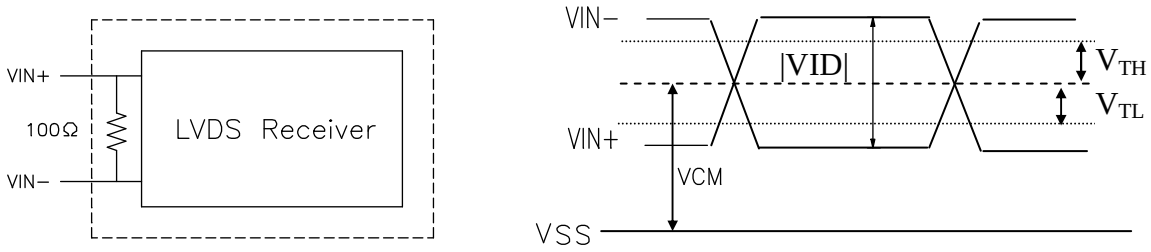


Max value is White Pattern：800 line mode.

Circuit condition (Max)：VCC=3.3 V，f_V=60 Hz，f_H=49.375 kHz，f_{CLK}=71.1 MHz.



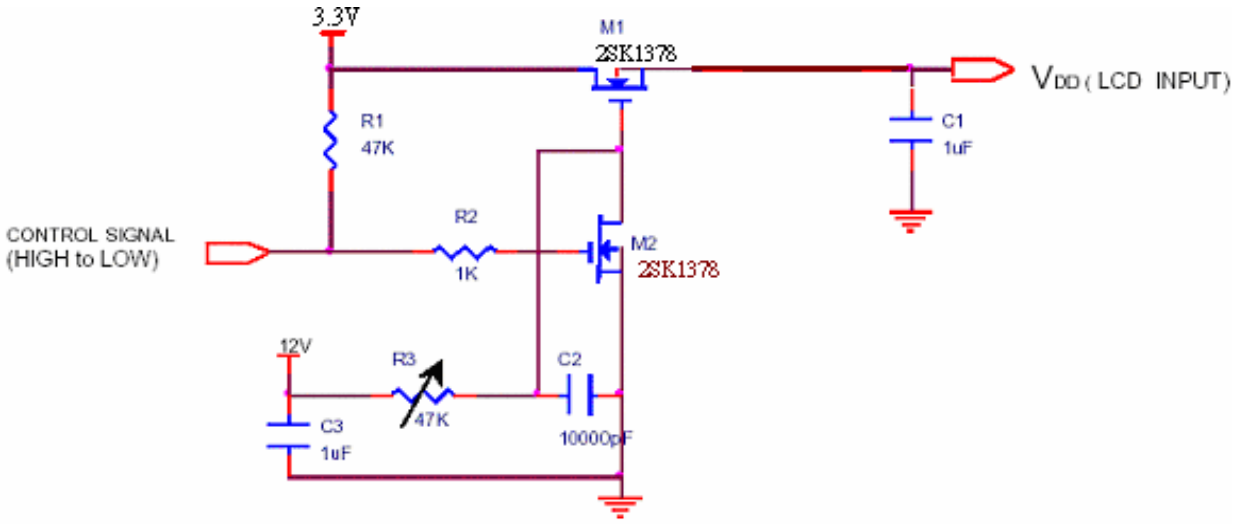
*3) LVDS Signal Definite：

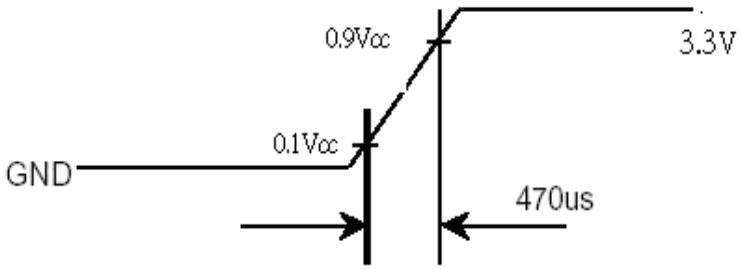


VIN+：Positive differential DATA & CLK Input

VIN-：Negative differential DATA & CLK Input

*4) Irush measure condition





(B) BACK LIGHT

(a.) ELECTRICAL CHARACTERISTICS

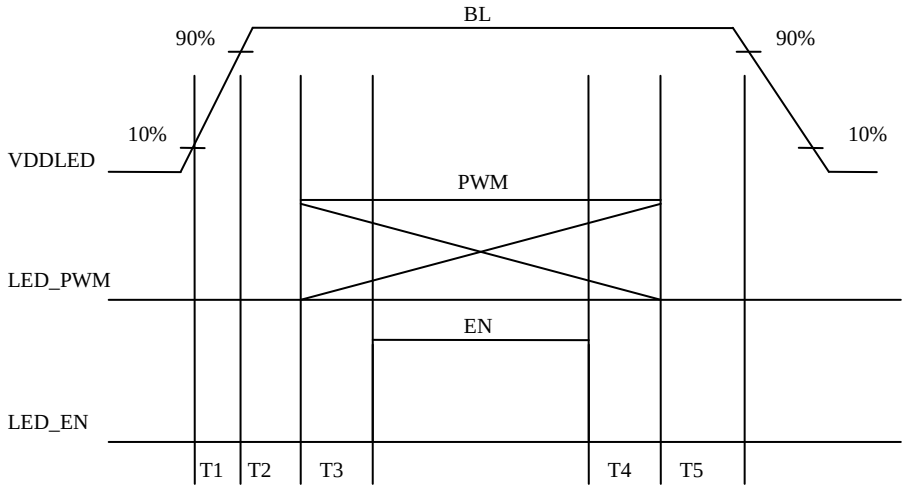
Ta=25℃

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LED Driver Input Voltage	VBL+	6.0	7.2	9.0	V	
LED Driver Input Current	IBL+	-	410	-	mA	*1)
Forward Voltage	V_F	3.0	3.1	3.2	V	*2) I_F=20mA
Forward Current	I_F	-	20.0	-	mA	*2) I_F=20mA
Power Consumption	PLED		2.6		W	*2)*3) I_F=20mA
PWM Frequency	PWM_BL	100	-	1000	Hz	
Duty ratio	Dim	1	-	100	%	

(b.) LED LIFE – TIME

ITEM	CONDITION	MIN	TYP	MAX	UNIT	NOTE
Life Time	I_F=20mA、Ta=25℃	12000			hrs	*4)

(c.) LED ON/OFF Sequence：



0.5ms ≦ T1 ≦ 10ms

10ms ≦ T2

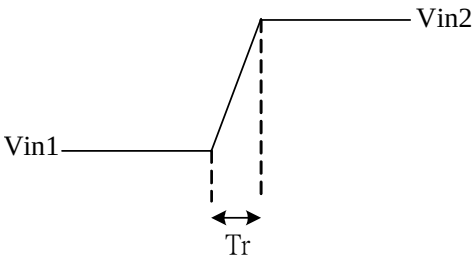
10ms ≦ T3

0ms ≦ T4

10ms ≦ T5

Note:

The LED power variation spec. is defined as the following figure.



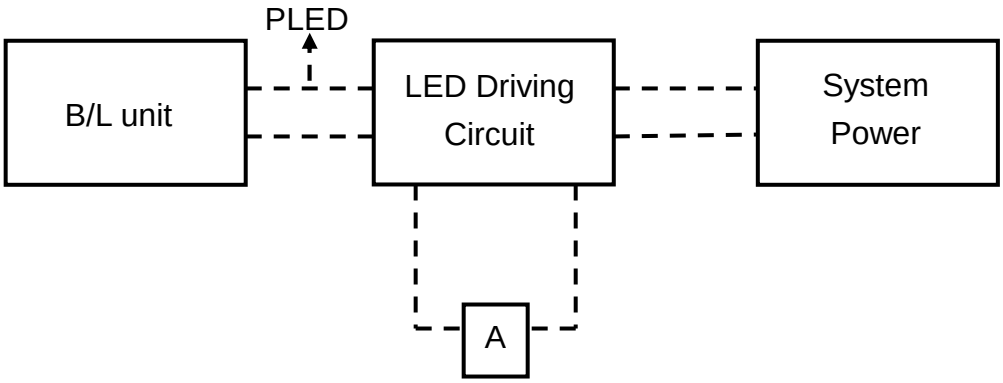
When LED input voltage is from Vin1 up to Vin2, the slew rate should be less than 20 V/ms.

Slew rate = (Vin2-Vin1) / Tr , Vin2 > Vin1

*1) Maximum LED Driver Input Current at 12V Input Voltage/PWM Duty 100%.

*2) Measure method：a. LED current is measured by utilizing a current meter as show below.

b. System power PLED is measured at input voltage 12V.



*2) Calculator value for reference $I_F \times V_F \times N$ = PLED

*3) Life time means that estimated time to 50% degradation of initial luminous intensity.

4. Connector Interface PIN & Function

CN (Interface signal)

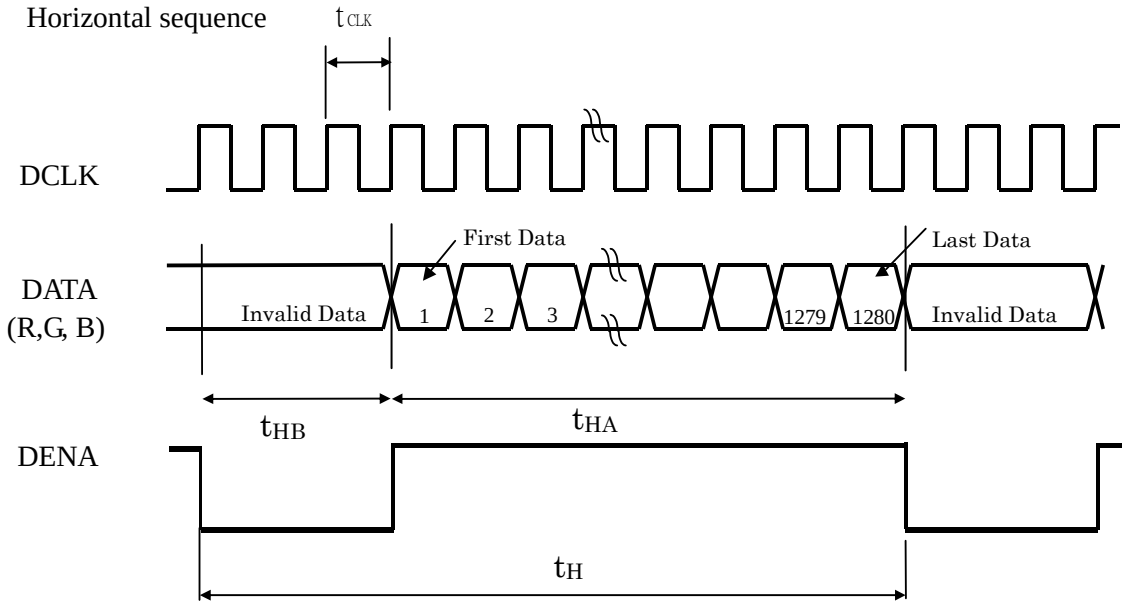
Outlet connector: HD1S040HA1 (JAE)

- Pin No. is 40 pin define of Plug connector

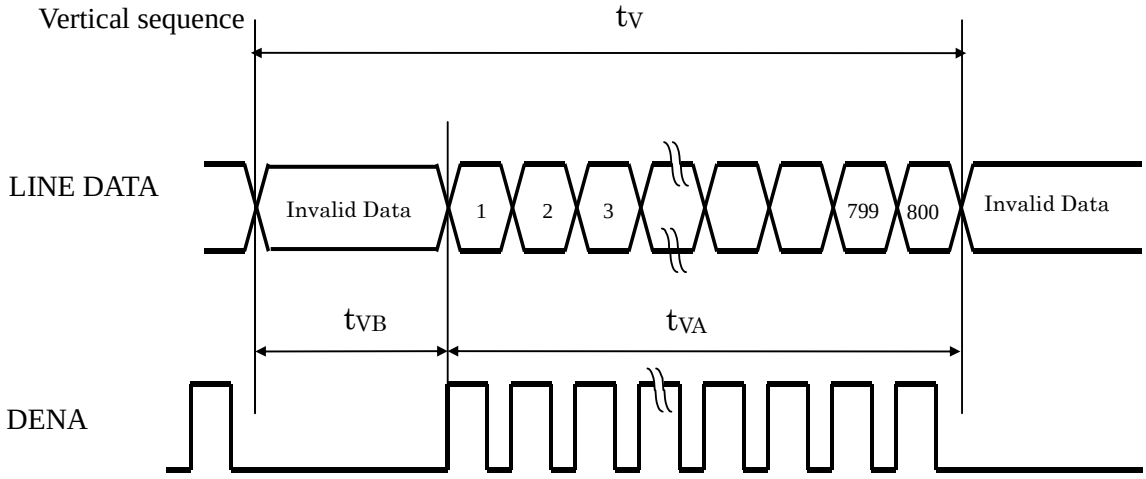
Pin No.	SYMBOL	FUNCTION
1	NC/(BIST)	No Connection
2	VDD	Power Supply, 3.3V (typical)
3	VDD	Power Supply, 3.3V (typical)
4	V_ EDID	3.3V power for EDID
5	NC	No Connection
6	CLK_EDID	EDID clock input
7	DATA_EDID	EDID data input
8	Odd Rxln0-	-LVDS Differential Data Input
9	Odd Rxln0+	+LVDS Differential Data Input
10	GND	Ground
11	Odd Rxln1-	-LVDS Differential Data Input
12	Odd Rxln1+	+LVDS Differential Data Input
13	GND	Ground
14	Odd Rxln2-	-LVDS Differential Data Input
15	Odd Rxln2+	+LVDS Differential Data Input
16	GND	Ground
17	Odd RxCLKIN-	-LVDS Differential Clock Input
18	Odd RxCLKIN+	+LVDS Differential Clock Input
19	GND	Ground
20	NC	No Connection
21	NC	No Connection
22	GND	Ground
23	NC	No Connection
24	NC	No Connection
25	GND	Ground
26	NC	No Connection
27	NC	No Connection
28	GND	Ground
29	NC	No Connection
30	NC	No Connection
31	GND	Ground
32	GND	Ground
33	GND	Ground
34	NC	No Connection
35	PWM	PWM Control Signal of LED Converter
36	LEN_EN	Enable Control Signal of LED Converter
37	NC	No Connection
38	VBL	LED Backlight Power
39	VBL	LED Backlight Power
40	VBL	LED Backlight Power

5. INTERFACE TIMING CHART

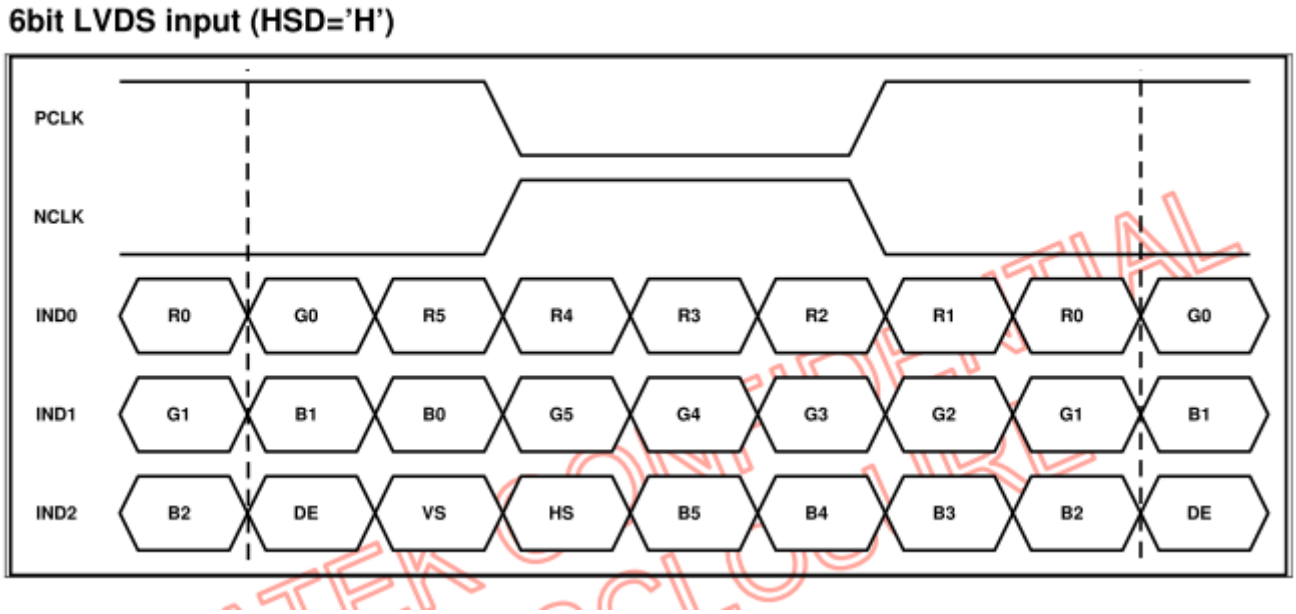
(1)(a) LVDS input time sequence



(b) LCD input time sequence



(c) LVDS Input Data mapping



(2) Timing Chart

ITEM				SYNBOL	MIN	TYP	MAX	UNIT
LCD Timing	Frame Rate			-	(60)	60	(60)	Hz
	DCLK		Frequency	f_{CLK}	66.6	71.11	78.9	MHz
			Period	t_{CLK}	15.01	14.06	12.67	ns
	DENA	Horizontal	Horizontal Total time	t_H	1370	1440	1500	t_{CLK}
			Horizontal Active time	t_{HA}	1280	1280	1280	t_{CLK}
			Horizontal Blank time	t_{HB}	90	160	220	t_{CLK}
		Vertical	Vertical Total time	t_V	810	823	877	t_H
			Vertical Active time	t_{VA}	800	800	800	t_H
			Vertical Blank time	t_{VB}	10	23	77	t_H
LVDS Spread Spectrum Range *3)					(-3)		(+3)	%

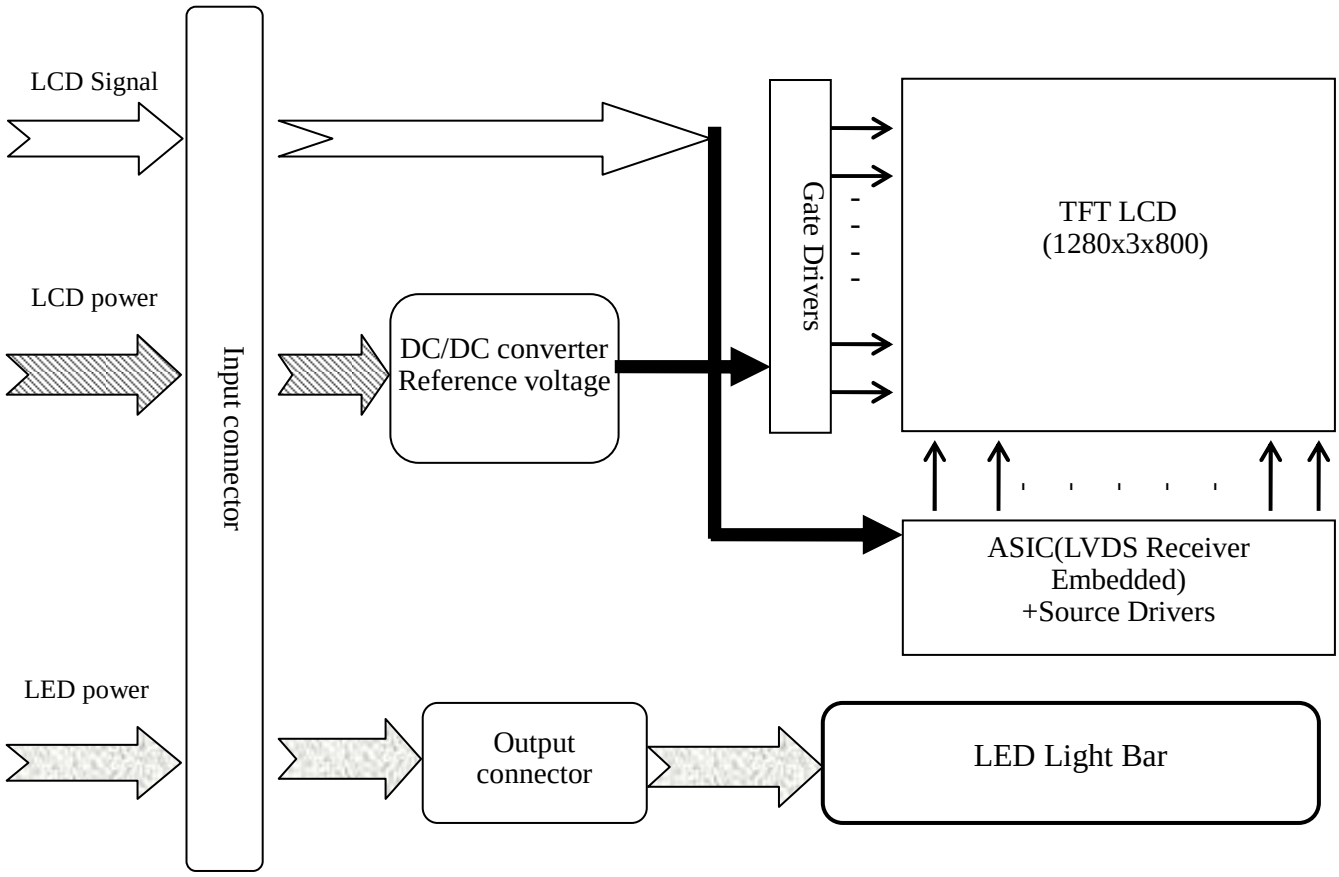
【Note】

*1) DENA (DATA ENABLE) usually is positive.

*2) During the whole blank period, DCLK should keep input.

*3) LVDS input clock is 71.11MHz and modulation rate is fixed 100kHz.

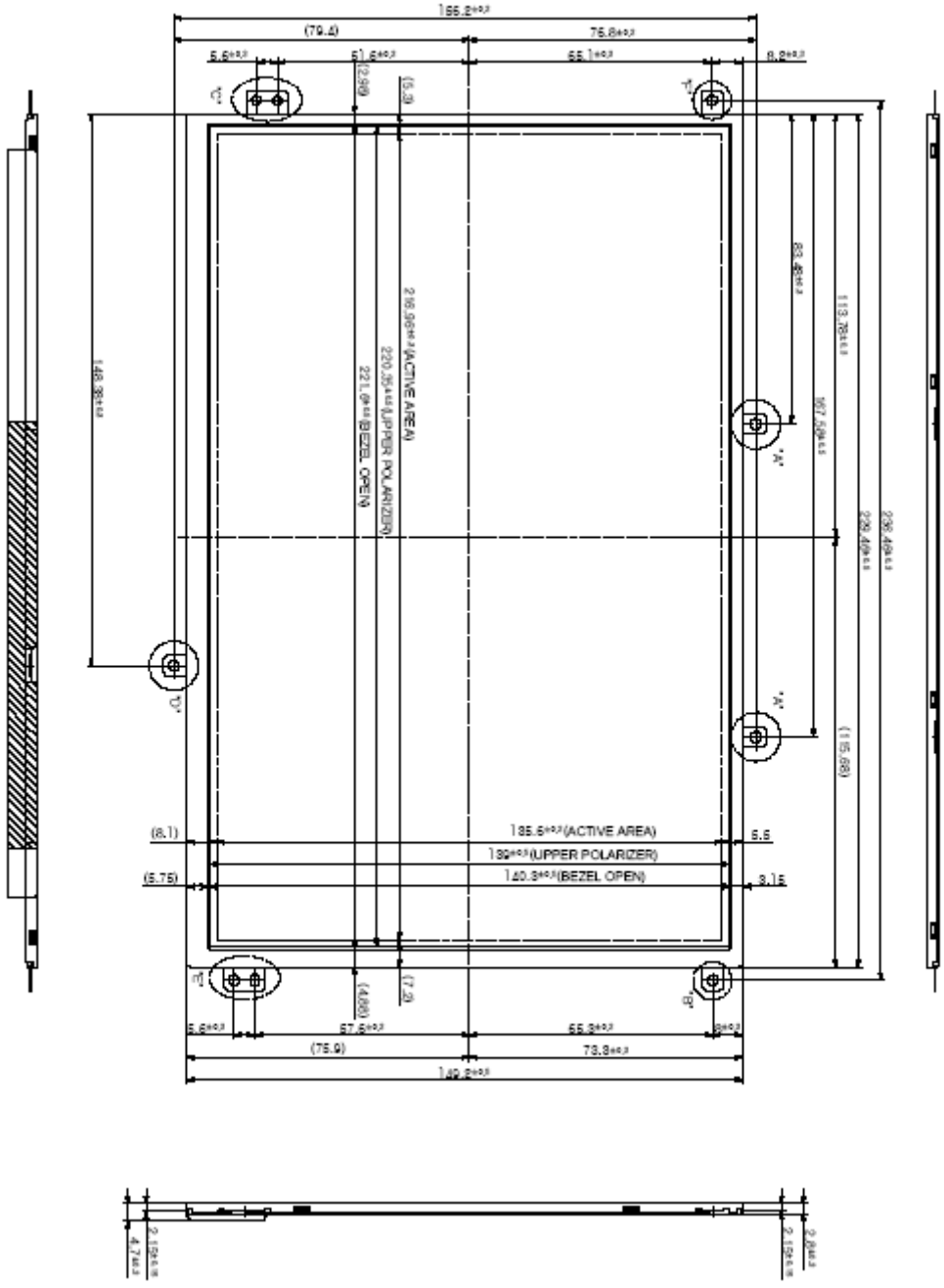
6. BLOCK DIAGRAM



7. MECHANICAL SPECIFICATION

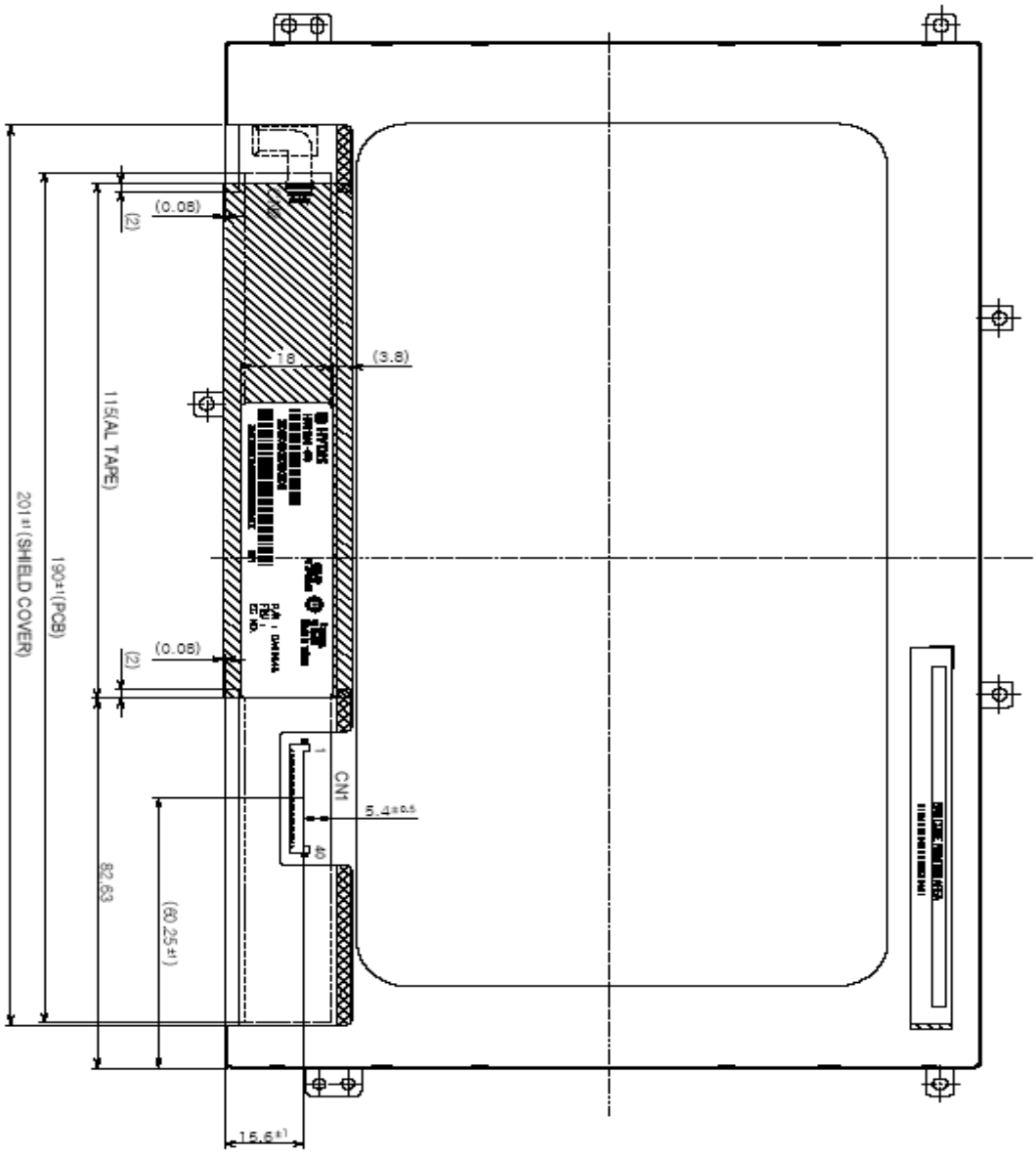
(1) Front side

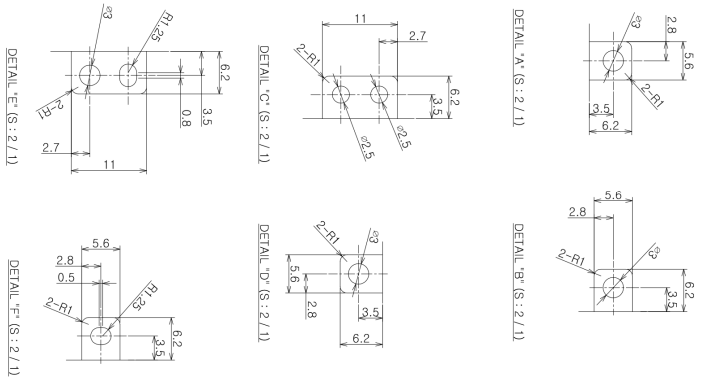
The tolerance, not show in the figure, is ±0.5 mm. **[Unit：mm]**



(2) Rear side

The tolerance, not show in the figure, is ±0.5 mm. **[Unit： mm]**





8. OPTICAL CHARACTERISTICS

Ta=25℃，VDD=3.3V

ITEM		SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	NOTE
Contrast Ratio		CR	θ=ψ= 0°	500	800	--	--	*1) 2)
Luminance (5P)		L	θ=ψ= 0°	300	400	--	cd/m^2	*1) 3)
Uniformity(9P)		ΔL	θ=ψ= 0°	80	--	--	%	*1) 3)
Uniformity(13P)		ΔL	θ=ψ= 0°	60	--	--	%	*1) 3)
Response Time		Tr	θ=ψ= 0°	--	30	40	ms	*5)
		Tf						
Cross Talk		CT	θ=ψ= 0°	--	--	1.0	%	*6)
View Angle	Horizontal	ψ	CR≧10	160	170	--	°	*4)
	Vertical	θ		160	170	--	°	*4)
Color Coordinate	W	x	θ=ψ= 0°	0.283	0.313	0.343		*3)
		y		0.299	0.329	0.359		
	R	x		(0.571)	(0.601)	(0.631)		
		y		(0.314)	(0.344)	(0.374)		
	G	x		(0.298)	(0.328)	(0.358)		
		y		(0.540)	(0.570)	(0.600)		
	B	x		(0.124)	(0.154)	(0.184)		
		y		(0.089)	(0.119)	(0.149)		
Gamut			θ=ψ= 0°	45	50	--	%	
Gamma		γ	GL	2.0	2.2	2.4		*7)

Color coordinate and color gamut are measured by SRUL1R, response time is measured by TRD-100, and all the other items are measured by BM-5A (TOPCON). All these items are measured under the dark room condition (no ambient light).

Measurement Condition: IL= 20mA (each LED)

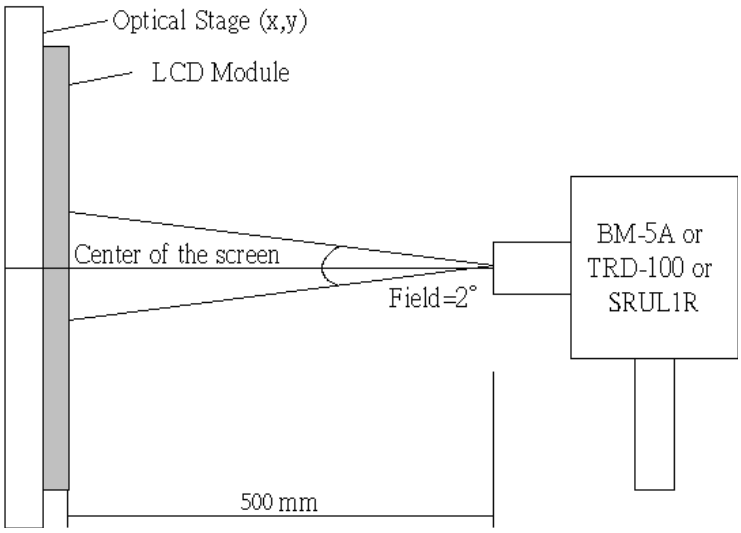
Definition of these measurement items is as follows:

***1) Setup of Measurement Equipment**

The LCD module should be turn-on to a stable luminance level to be reached. The measurement should be executed after lighting Backlight for 20 minutes and in a dark room.

***2) Definition of Contrast Ratio**

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



***3) Definition of Luminance and Luminance uniformity**

Central luminance: The white luminance is measured at the center position "5" on the screen, see Fig.1 below.

5P Luminance (AVG): The white luminance is measured at measuring points 5、10、11、12、13, see Fig.1 below.

5P Uniformity: Δ L = (Lmin / Lmax) ×100%

13P Uniformity: Δ L = (Lmin / Lmax) ×100%

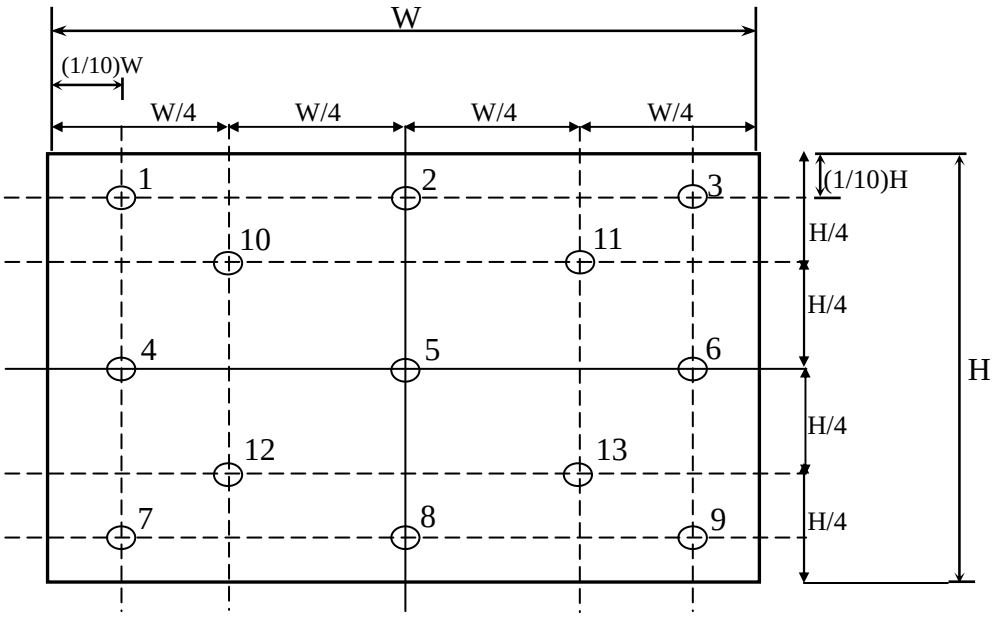
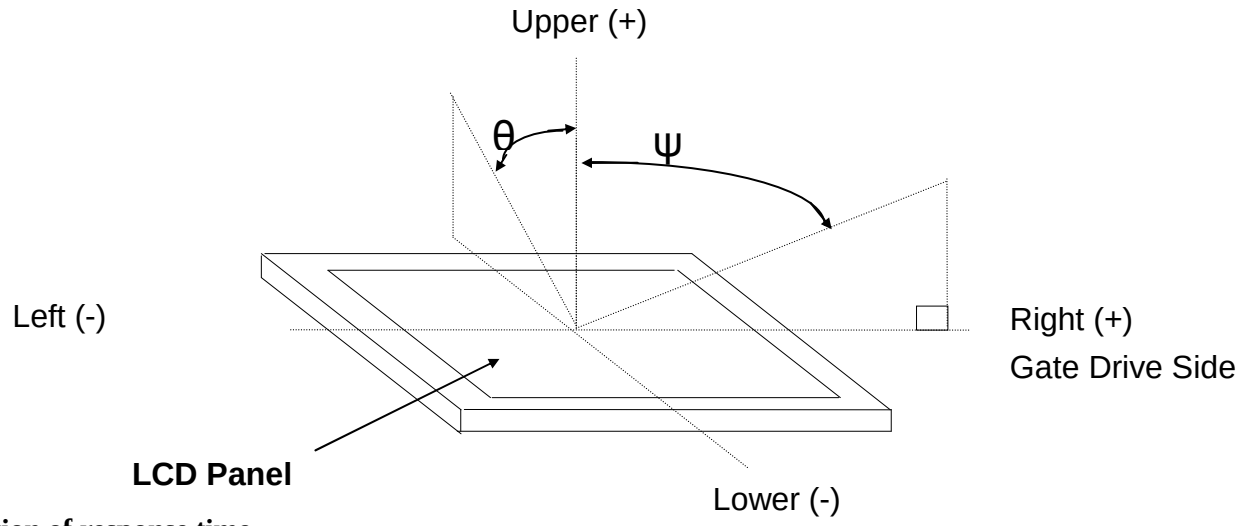
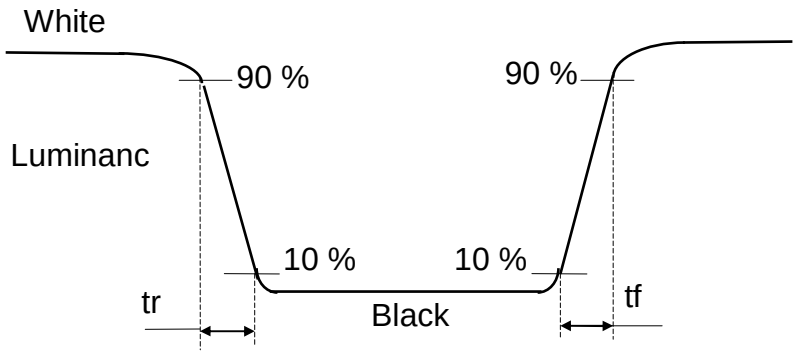


Fig.1 Measure point (Active area)

***4) Definition of view angle(θ，ψ)**



***5) Definition of response time**



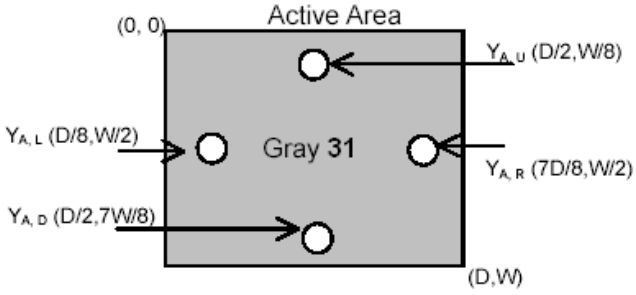
***6) Crosstalk Modulation Ratio**

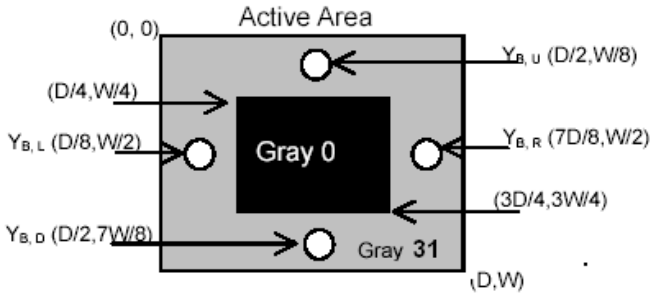
CT=｜Y_B-Y_A｜ / $Y_{A\times}$× 100%

Y_A、Y_B measure position and definition

Y_A means luminance at gray level 31(exclude gray level 0 pattern)

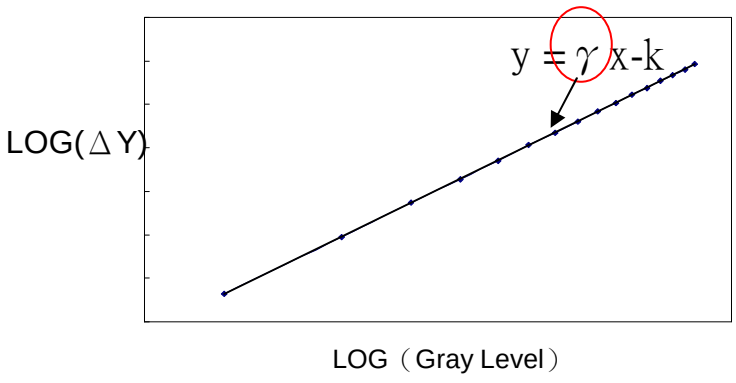
Y_B means luminance at gray level 31(include gray level 0 pattern)





***7) Definition of Gamma (VESA)**

Based on Customer Sample, take the average value as a standard center value and the variation range of gamma value caused by loop voltage error should be between +/- 0.2. the bellow figure shows how to obtain the gamma curve and γ (from gray level: 0、4、8-----60、63).



9. RELIABILITY TEST CONDITIONS

(1) Temperature and Humidity

TEST ITEMS	CONDITIONS
High Temperature Operation	50°C ；250Hrs
High Temperature Storage	65°C ；250Hrs
High Temperature High Humidity Operation	40°C ；95% RH；240Hrs
High Temperature High Humidity Storage	60°C ；90% RH；48 Hrs
Low Temperature Operation	0°C ；250 Hrs
Low Temperature Storage	-30°C ；250 Hrs
Thermal Shock	-40°C(0.5 Hr)～65°C(0.5 Hr), Ramp<20°C, 100 CYCLES
Temperature & Pressure Storage	-30°C ；260hPa，24 Hrs

(2) Shock & Vibration

TEST ITEMS	CONDITIONS
Shock (Non-Operation)	210G, 3ms, half sin ewave, ± X,± Y,± Z 1time each
Vibration (Non-Operation)	Vibration level: 14.7m/s2, 1.5G, sinusoidal wave (each x, y, z axis: 1hr, total 3 hrs) Frequency range: 5Hz to 500 Hz Sweep speed : 0.5 Octave/min

(3) ESD

	Surface discharge(Panel display area、Frame、PWB、Panel back side)		Electrics capacity of Connector
	Contact	Air	Contact
Capacity	150 pF	150 pF	200 pF
Resistance	330 Ω	330 Ω	0 Ω
Voltage	±8kV/±15kV	±8kV/±15kV	±250 V
Interval	1 sec	1 sec	1 sec
Times(single point)	25	25	1

(4) MTBF without B/L: 200,000 Hrs (min) lifetimes.

(5) 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.