Chunghwa Picture Tubes, Ltd.
Technical Specification

To : **Studio Technology Co.,Ltd**

Date : **2009/06/23**

CPT TFT-LCD
CLAA116WA01A

Accepted by:

APPROVED BY	CHECKED BY	PREPARED BY
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CHUNGHWA PICTUER TUBES, LTD.

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Modification Record List

NO.	Issue Date	Modification Index
1	2009/05/05	The first version (Tentative)

Table Of Content

1. OVERVIEW

CLAA116WA01A is 29.3 cm (11.6") color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, driver ICs, control circuit and LED backlight. By applying 1366×768 images are displayed on the 11.6" diagonal screen. Display 262K colors by 6 Bit R.G.B signal input. Use 3.3 voltages to drive the power of LCD system. General specification is summarized in the following table：

ITEM	SPECIFICATION		
Display Area (mm)	256.125 (H) x 144.00 (V) (11.6-inch diagonal)		
Number of Pixels	1366(H) × 3(RGB) × 768(V)		
Pixel Pitch (mm)	0.1875 (H) × 0.1875 (V)		
Color Pixel Arrangement	RGB vertical stripe		
Display Mode	Normally white, TN		
Number of Colors	262,144		
Optimum Viewing Angle	6 o'clock		
Response Time (ms)	10ms		
Viewing Angle (L/R/U/D)	45°、45° /15°、30° (Typ.)		
Brightness(cd/m^2)--5 point average	200 (typ)		
Uniformity (Min)	5point：80%		
Consumption of Power (W)	4.0W（Max）		
Module Weight (g)	255 (max)		
Backlight Unit	LED		
Electrical Interface(data)	LVDS		
Surface Treatment	Glare type , Hardness：3H		
Module Size (mm)		Min.	Typ.	Max.
	Horizontal (H)	267.7	268	268.3
	Vertical (V)	161.2	161.5	161.8
	Depth (D)	--	--	5.2

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
Power Supply Voltage for LCD	VCC	0	4.0	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℃.
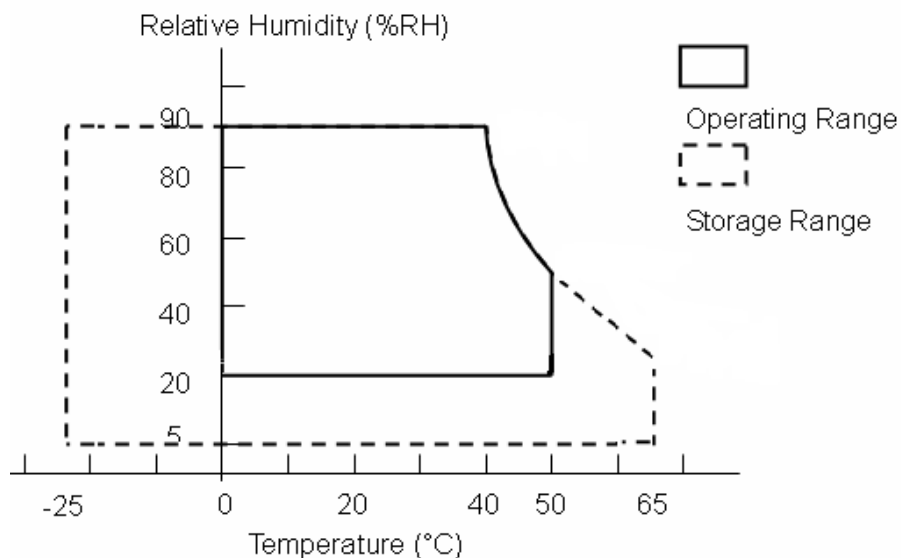
3. ELECTRICAL CHARACTERISTICS

(A) TFT LCD

TEM		SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD POWER VOLTAGE		VCC	3.0	3.3	3.6	V	【Note 1】
LCD POWER CURRENT		ICC	-	350	400	mA	【Note 2】
Rush CRRENT		Irush	-	-	1	A	【Note 4】
LOGIC INPUT VOLTAGE (LVDS: IN+,IN-)	COMMON VOLTAGE	VCM	1.08	1.2	1.32	V	【Note 3】
	DIFFRENTIAL INPUT VOLTAGE	∣VID∣	250	350	450	mV	【Note 3】
	THRESHOLD VOLTAGE (HIGH)	VTH	-	-	100	mV	【Note 3】 When VCM = +1.2V
	THRESHOLD VOLTAGE (LOW)	VTL	-100	-	-	mV	

【Note 1】Power Sequence：

　　0.5 ms ≦t1≦10ms　　　　　1 sec≦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
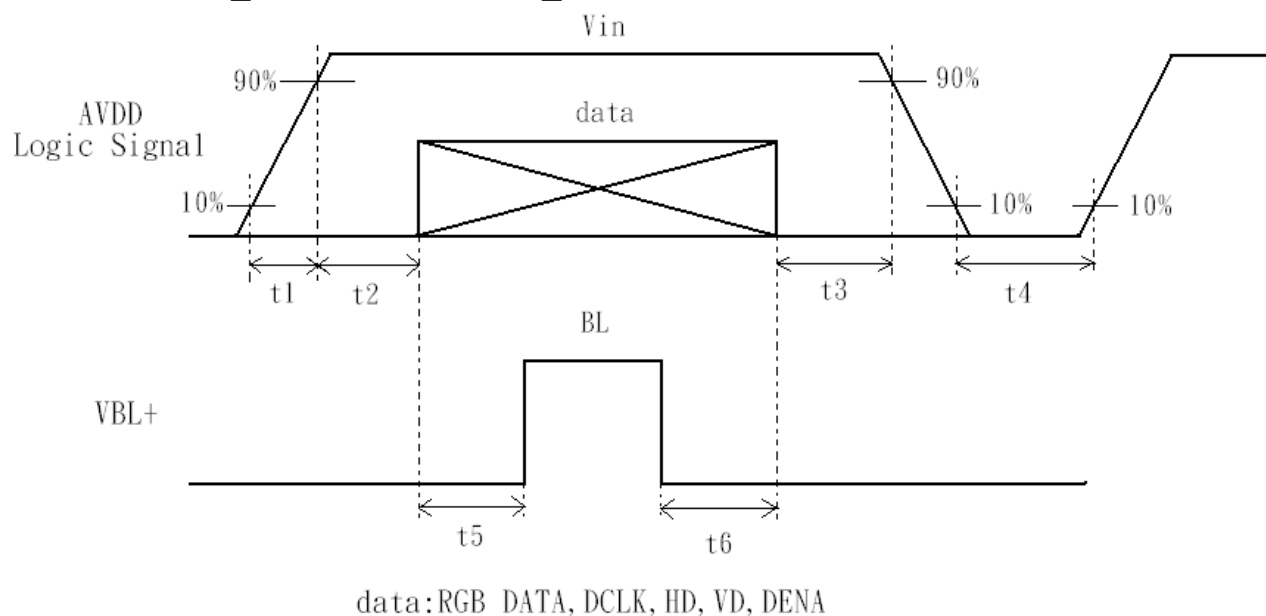
VCC-dip state

　　(1)when 3.0＞VCC≧2.7V，td≦10 ms
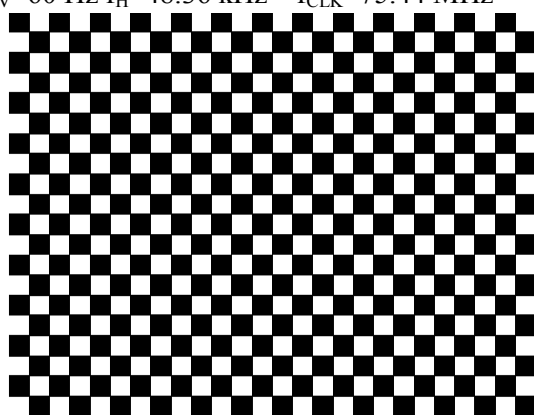
　　(2)when VCC＜2.7V，VCC-dip condition should as the VCC-turn-off condition.
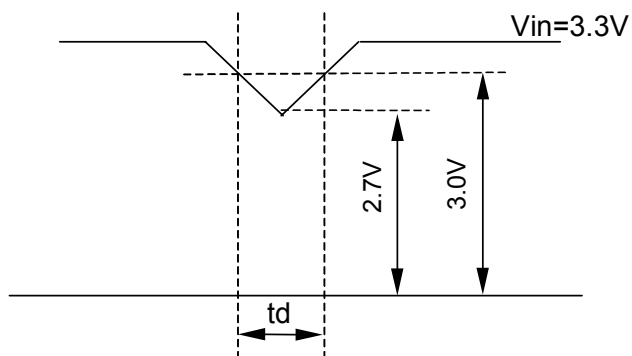
【Note2】Typical value is Mosaic (32*36 Checker board) Pattern：768 line mode。
    Circuit condition (Typ.)：
        VCC=3.3 V，f_V=60 Hz f_H=48.36 kHz，f_{CLK}=75.44 MHz

    Max value is Black Pattern：768 line mode。
    Circuit condition (Max.)：VCC=3.3 V，f_V=60 Hz f_H=48.36 kHz，f_{CLK}=75.44 MHz
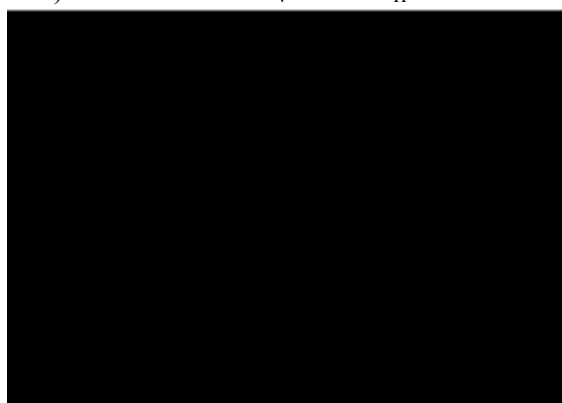
【Note 3】LVDS Signal Definite：
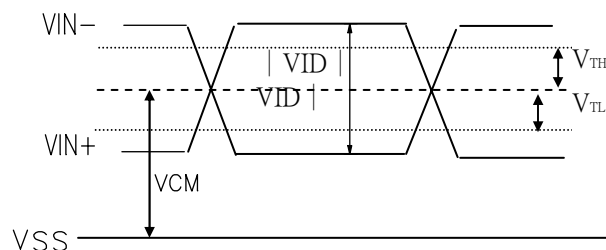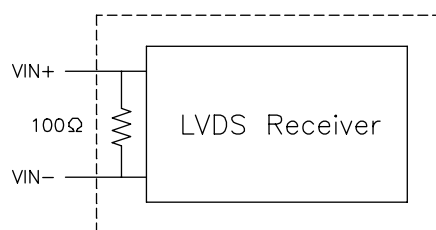
        VIN+：Positive differential DATA & CLK Input
        VIN-：Negative differential DATA & CLK Input

【Note 4】Irush measure condition
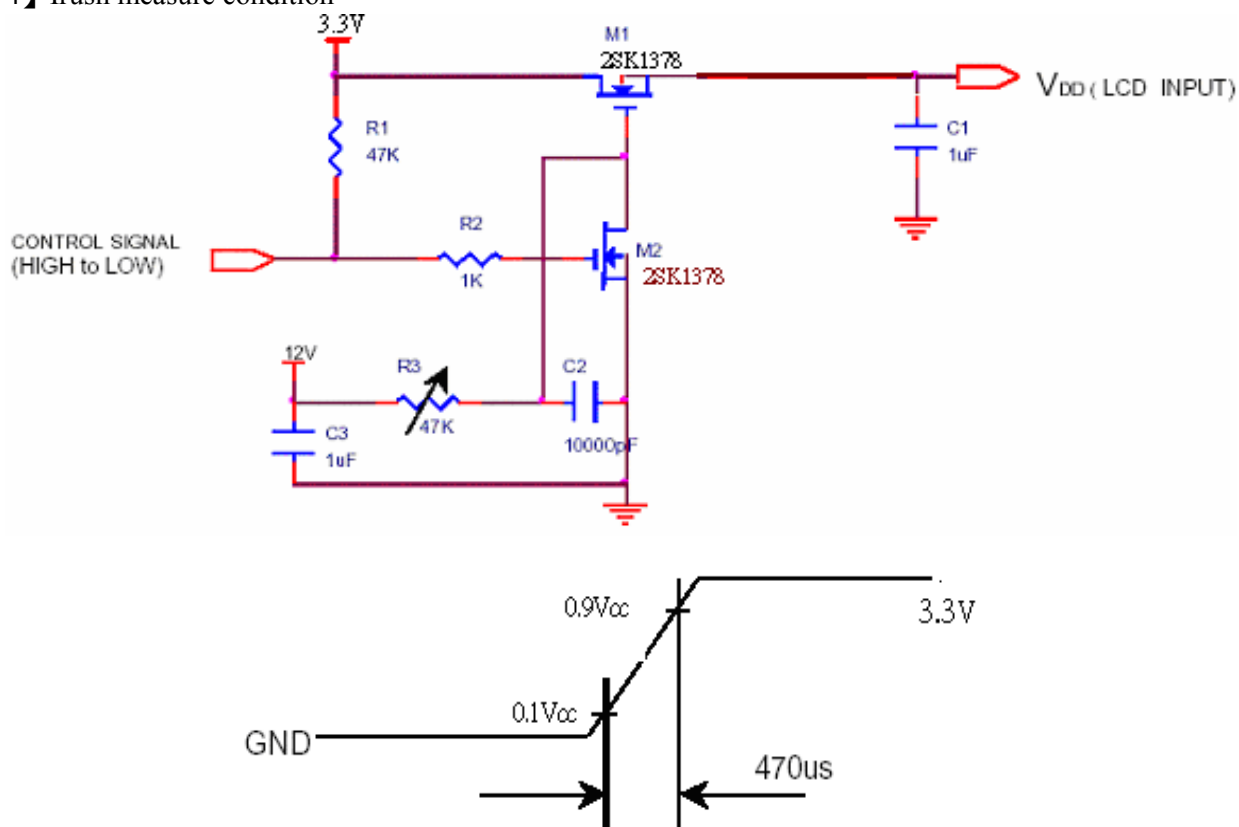
(B) BACK LIGHT

(a.) ELECTRICAL CHARACTERISTICS

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LED Driver Input Voltage	VBL+	5	-	19	V	
LED Driver Input Current	IBL+	-	-	550	mA	VBL+=5V
Forward Voltage	VF	2.8	3.1	3.5	V	*1)I_F=20mA
Forward Current	IF		20		mA	*1)
Power consumption	PLED	56	62	70	mW	*1)*2)I_F=18mA
PWM Frequency	PWM_BL	180	200	1k	Hz	
Duty ratio	Dim	10		100	%	

Ta=25℃

(b) LED LIFE – TIME

ITEM	Condition	min	typ	max	UNIT	NOTE
LIFE TIME	I_F=20mA、Ta=25℃	15000			hrs	*3)

(c) LED ON/OFF Sequence：
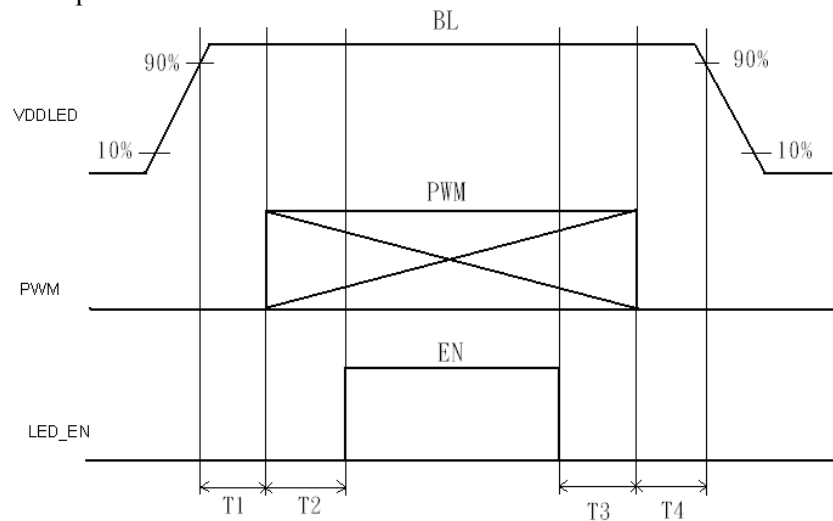
$$10ms \leqq T1 \qquad 0ms \leqq T3$$
$$10ms \leqq T2 \qquad 10ms \leqq T4$$

Note：The duty of LED dimming signal should be more than 20% in T2 and T3

*1)Measure method：a. LED current is measured by utilizing a current meter as show below.
　　　　　　　　　b. we set up system power input voltage at 12v to measurement PLED.
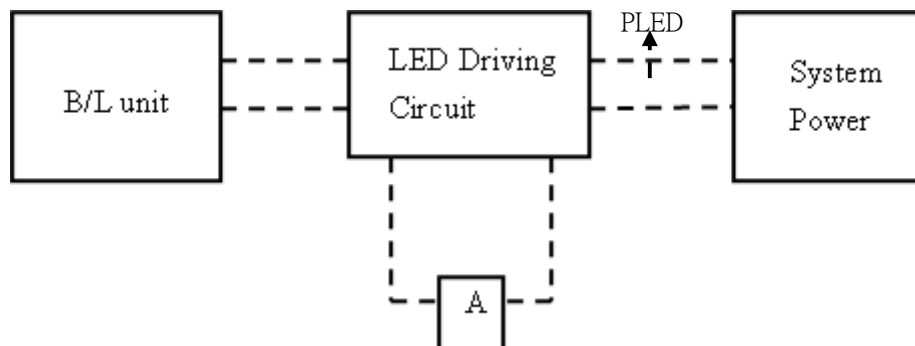
*2) Calculator value for reference IF*VF=P
*3)Life time means that estimated time to 50% degradation of initial luminous intensity.

4. Connector Interface PIN & Function

CN(Interface signal)

Connector type：I-PEX 20455-040E-12 or compatible

Pin No.	SYMBOL	FUNCTION
1	NC	NC
2	V_{CC}	+3.3V Power
3	V_{CC}	+3.3V Power
4	V_EDID	EDID 3.3V Power
5	NC	No Connect
6	CLK_EDID	EDID Clock
7	DATA_EDID	EDID Data
8	RXIN0-	LVDS Signal(-)—channel 0
9	RXIN0+	LVDS Signal(+)—channel 0
10	GND	Ground
11	RXIN1-	LVDS Signal(-)—channel 1
12	RXIN1+	LVDS Signal(+)—channel 1
13	GND	Ground
14	RXIN2-	LVDS Signal(-)—channel 2
15	RXIN2+	LVDS Signal(+)—channel 2
16	GND	Ground
17	RXCLKIN-	LVDS Clock Signal(-)
18	RXCLKIN+	LVDS Clock Signal(+)
19	GND	Ground
20	NC	NC
21	NC	NC
22	GND	Ground
23	NC	NC
24	NC	NC
25	GND	Ground
26	NC	NC
27	NC	NC
28	GND	Ground
29	NC	NC
30	NC	NC
31	GND	Ground
32	GND	Ground
33	GND	Ground
34	NC	NC
35	ADJ	Adjust for LED brightness
36	LED-EN	LED Enable pin(+3V Input)
37	NC	NC
38	V_{LED}	Power Supply for LED(V_{LED} =5V ~ 21V)
39	V_{LED}	Power Supply for LED(V_{LED} =5V ~ 21V)
40	V_{LED}	Power Supply for LED(V_{LED} =5V ~ 21V)

5. INTERFACE TIMING CHART

(1)(a). LVDS input time sequence

Horizontal sequence
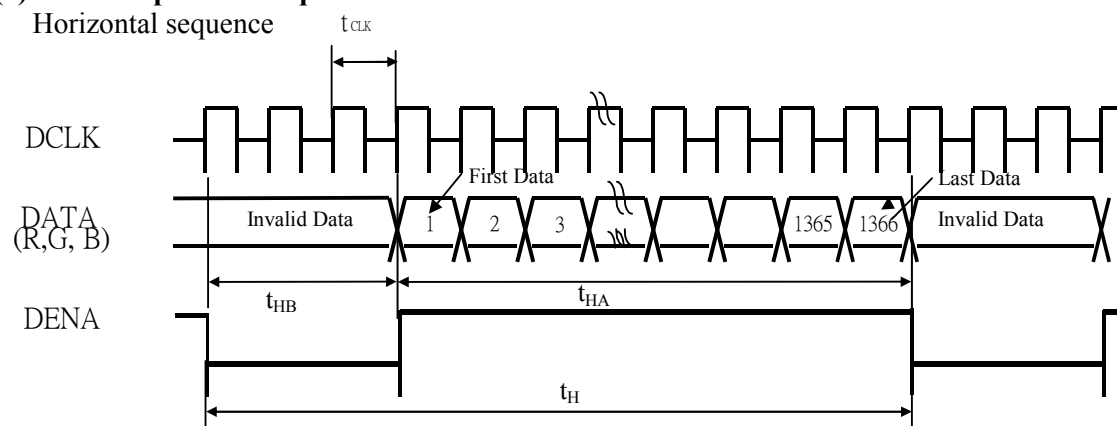
(b) LCD input time sequence

Vertical sequence
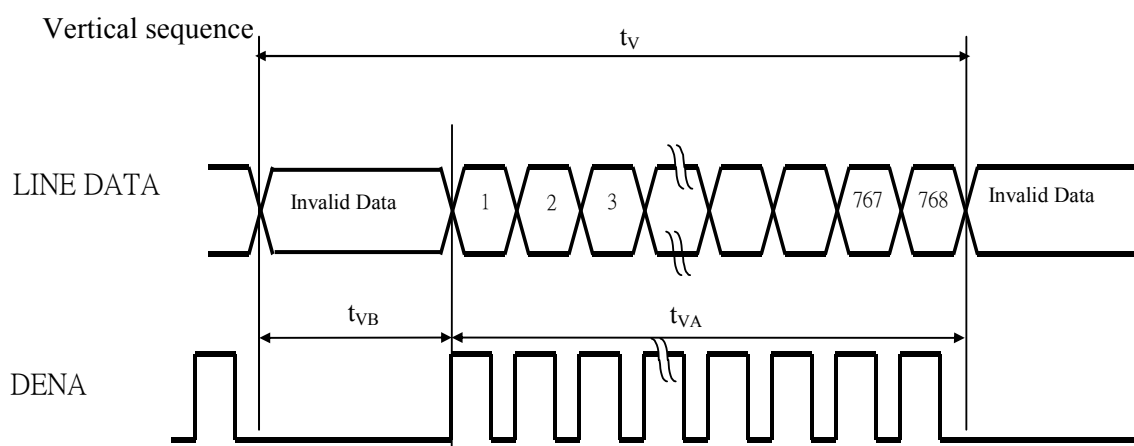
(2) Timing Chart

ITEM			SYNBOL	MIN	TYP	MAX	UNIT
Frame Rate			-		60		Hz
	DCLK	Frequency	f_{CLK}	65.6	69.3	77.0	MHz
		Period	t_{CLK}	13.0	14.3	16.2	ns
LCD Timing	DENA	Horizontal — Horizontal total time	t_H	1410	1433	1530	t_{CLK}
		Horizontal Active time	t_{HA}		1366		t_{CLK}
		Horizontal Blank time	t_{HB}	44	67	164	t_{CLK}
		Vertical — Vertical total time	t_V	775	806	840	t_H
		Vertical Active time	t_{VA}		768		t_H
		Vertical Blank time	t_{VB}	7	38	72	t_H

【Note】

　　*1) DENA (DATA ENABLE) usually is positive.
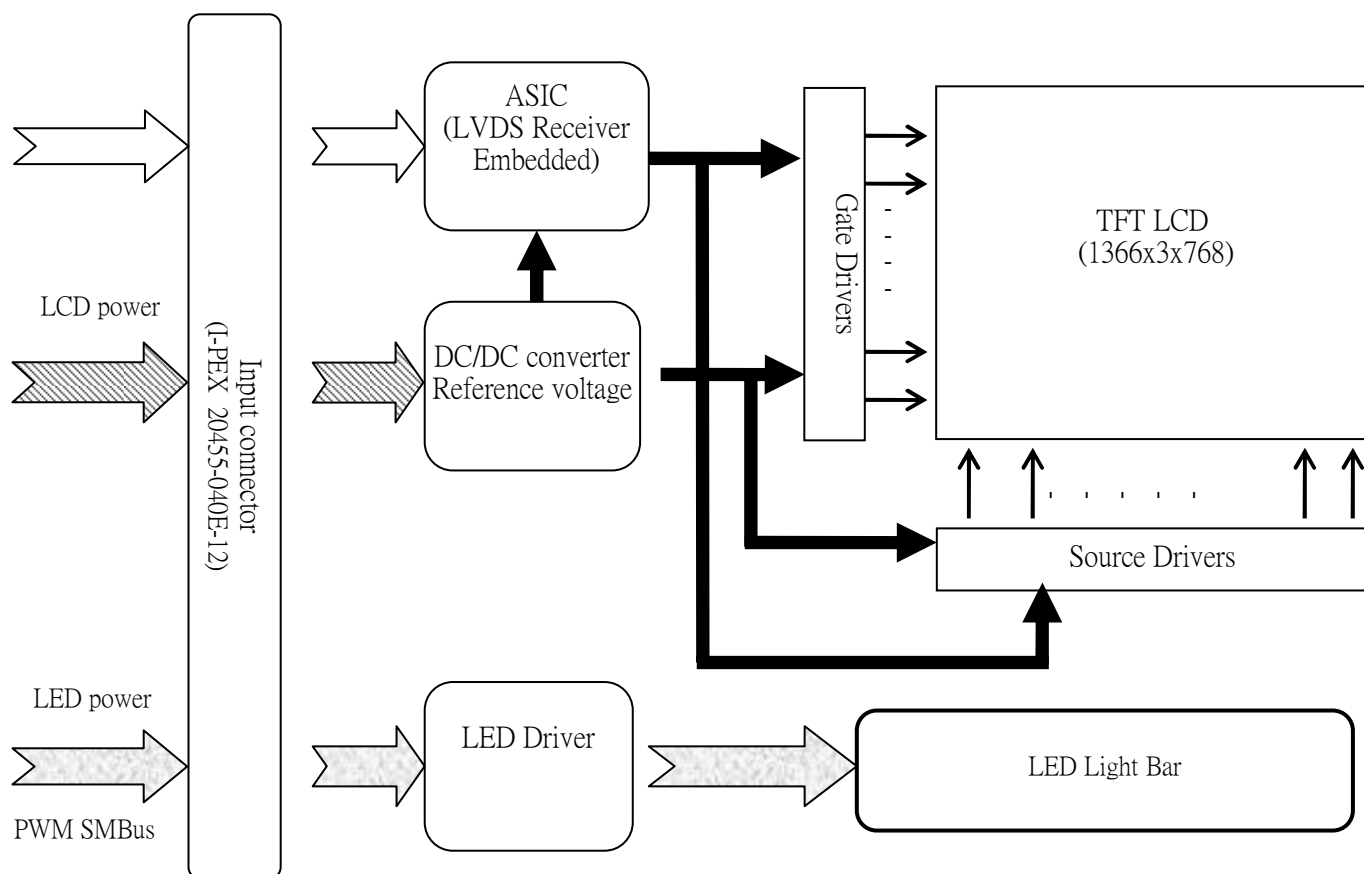
　　*2) During the whole blank period, DCLK should keep input.

(3) DATA mapping

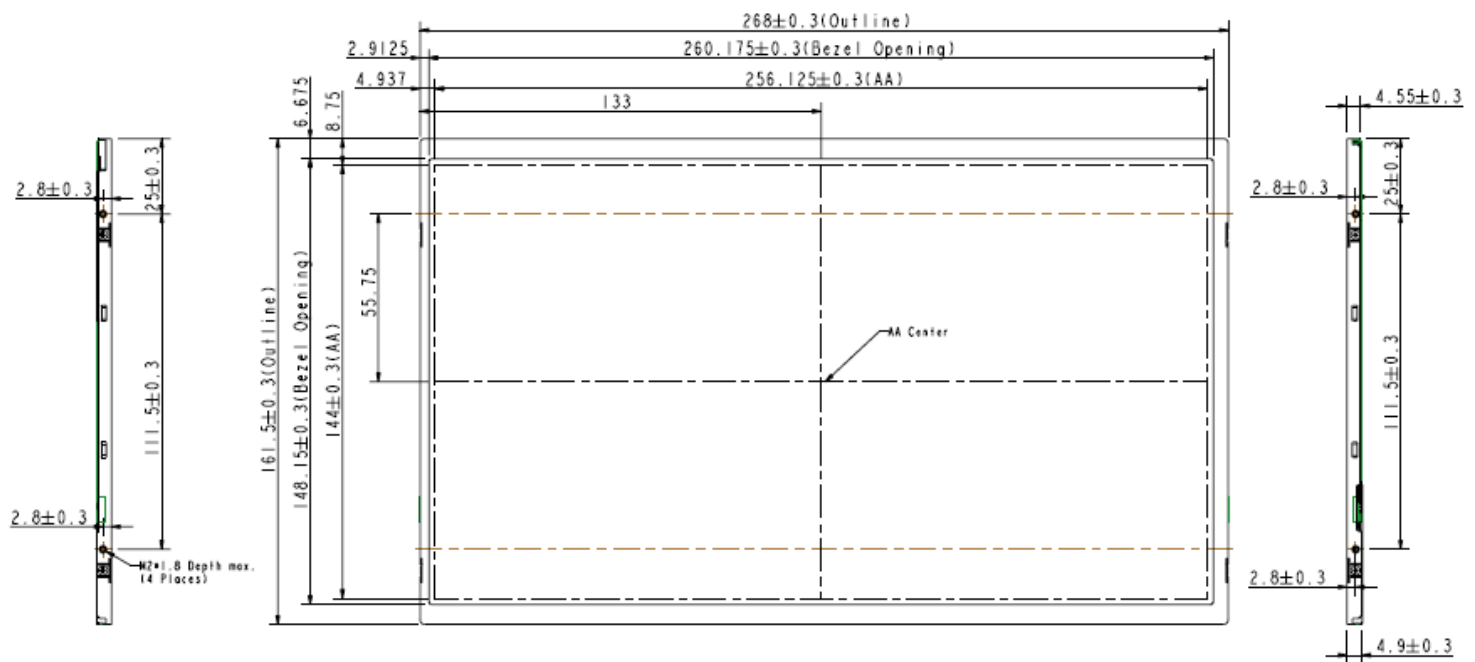| Color	Input Data	R DATA						G DATA						B DATA					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
		MSB					LSB	MSB					LSB	MSB					LSB
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(63)	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

【Note】

1) Gray level:

Color(n)：n is level order; higher n means brighter level.

2) DATA:

1: high，0: low

6. BLOCK DIAGRAM

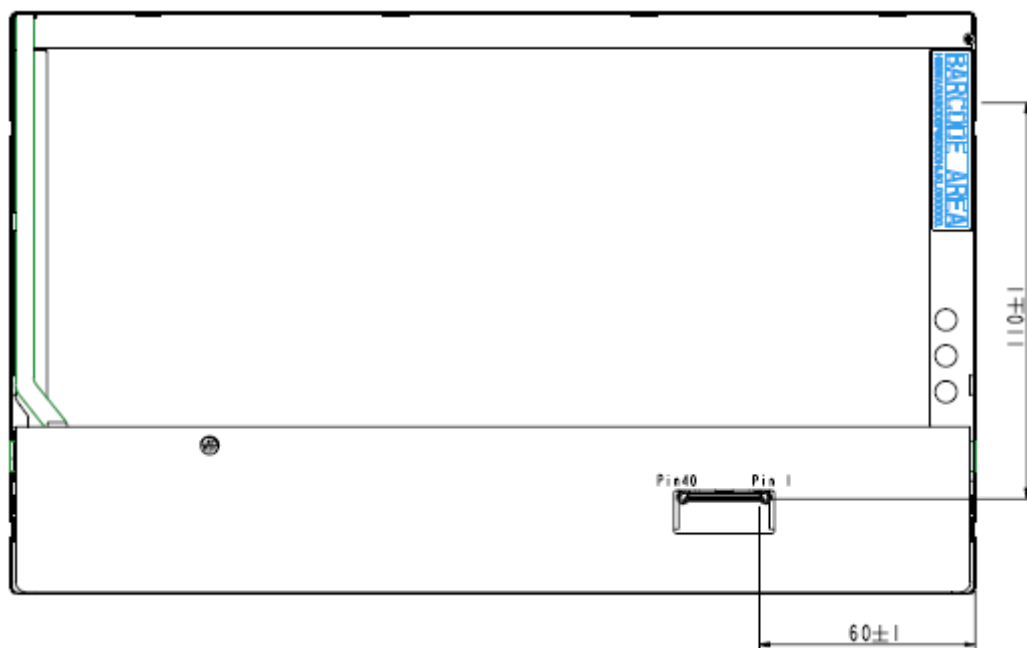# 7. MECHANICAL SPECIFICATION

(1) Front side

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

2) Rear side

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

8. OPTICAL CHARACTERISTICS

Ta=25℃，VDD=3.3V

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast Ratio		CR	Point-7		400	-	--	*1) 2)
Luminance (5P)		L	5-Point Avg.	TBD	200	-	cd/m^2	*1) 3)
Uniformity(5P)		ΔL	θ＝ψ＝ 0°	80	-	-	%	*1) 3)
Response Time		Tr	θ＝ψ＝ 0°	-	10	16	ms	*5)
Cross talk		CT	θ＝ψ＝ 0°	-	-		%	*6)
View angle	Horizontal	Ψ	CR≧10	45/-45	-	-	°	*4)
	Vertical	θ		15/-30	-	-	°	*4)
Color Temperature Coordinate	W	X	θ＝ψ＝ 0°	0.293	0.313	0.333		*3)
		Y		0.309	0.329	0.349		
	R	X		0.550	0.580	0.610		
		Y		0.310	0.340	0.370		
	G	X		0.280	0.310	0.340		
		Y		0.520	0.550	0.580		
	B	X		0.125	0.155	0.185		
		Y		0.125	0.155	0.185		
Gamut			θ＝ψ＝ 0°	42%	45%			
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=18mA(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
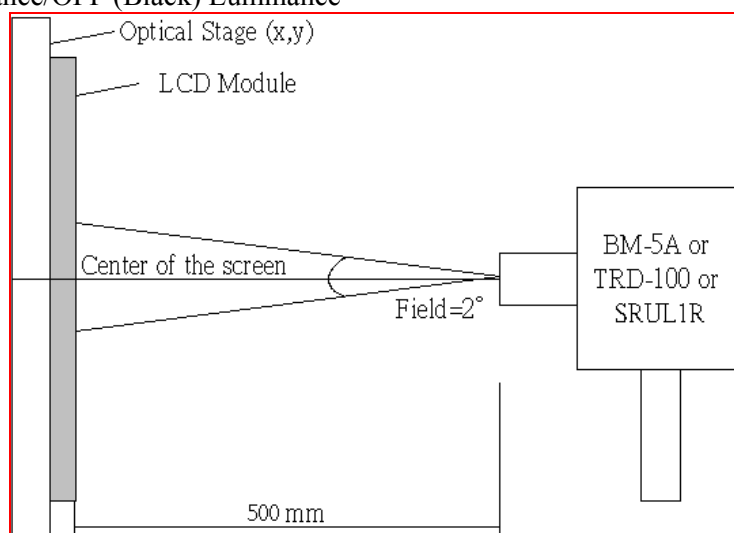
*3) Definition of Luminance and Luminance uniformity

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.

$\triangle L = Lw(Min)_{5points} \div Lw(Max)_{5points}$

$\triangle L = Lw(Min)_{13\ points} \div Lw(Max)_{13\ points}$
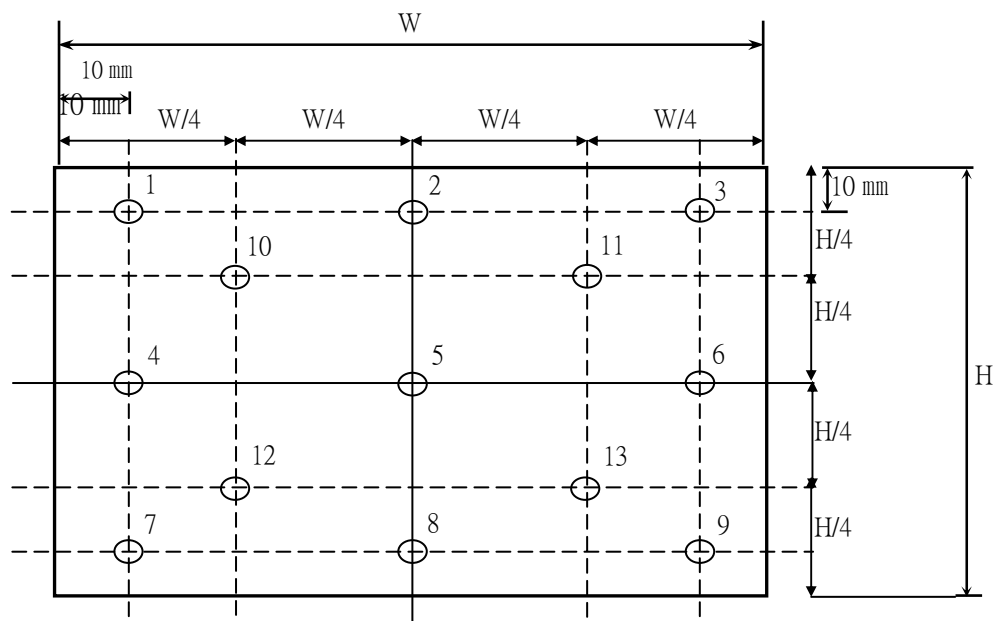
Fig.1 Measure point (Active area)

*4) Definition of view angle(θ, ψ)

Upper(+)

θ ψ

Left(-)
Gate Drive Side

Right(+)

LCD Panel

Lower(-)
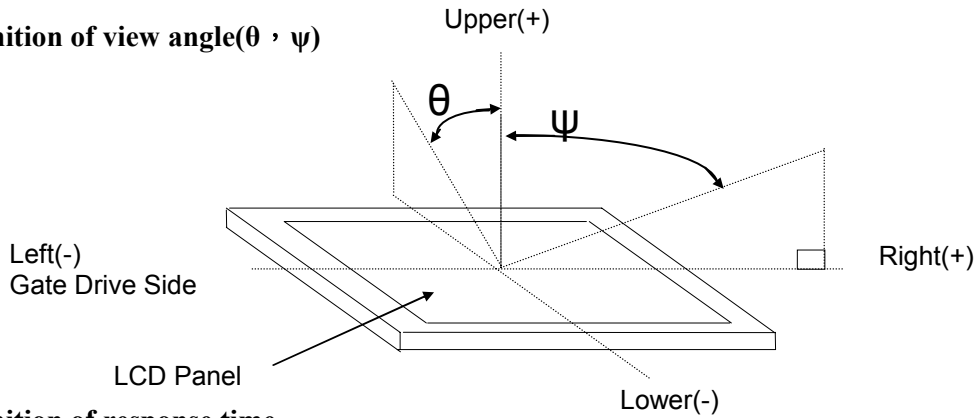
*5) Definition of response time

White

90 %   90 %

Luminance

10 %   10 %

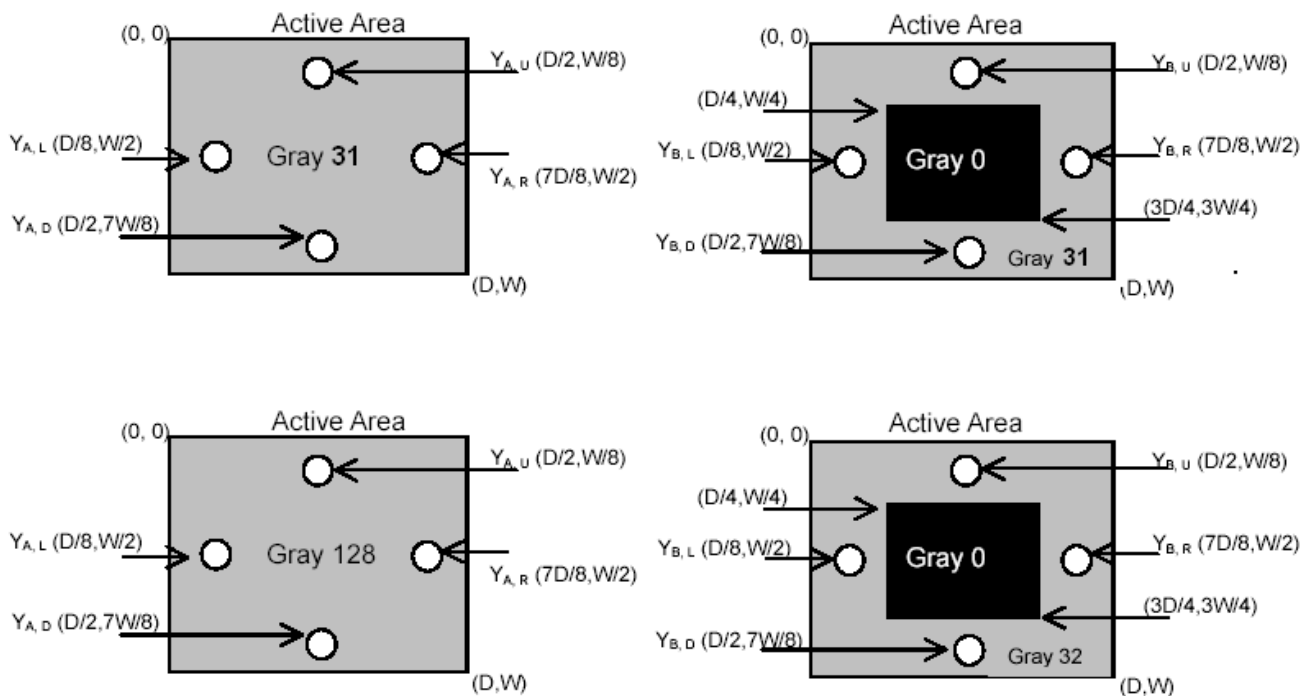tr   tf

Black
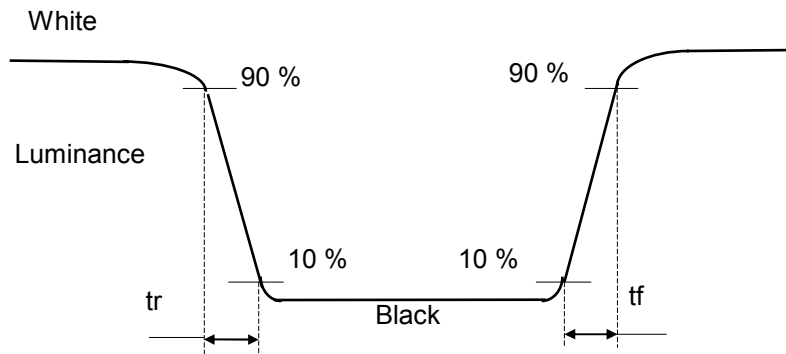
*6) Crosstalk Modulation Ratio:

$CT = |Y_B - Y_A| / Y_{A\times} \times 100\%$

Y_A、Y_B measure position and definition

Y_A means luminance at gray level 32(exclude gray level 0 pattern)

Y_B means luminance at gray level 32(include gray level 0 pattern)

(0, 0)   Active Area

$Y_{A,U}$ (D/2,W/8)

$Y_{A,L}$ (D/8,W/2)   Gray 31 $Y_{A,R}$ (7D/8,W/2)

$Y_{A,D}$ (D/2,7W/8)

(D,W)

(0, 0)   Active Area

$Y_{B,U}$ (D/2,W/8)

(D/4,W/4)

$Y_{B,L}$ (D/8,W/2)   Gray 0 $Y_{B,R}$ (7D/8,W/2)

(3D/4,3W/4)

$Y_{B,D}$ (D/2,7W/8)   Gray 31

(D,W)

(0, 0)   Active Area

$Y_{A,U}$ (D/2,W/8)

$Y_{A,L}$ (D/8,W/2)   Gray 128 $Y_{A,R}$ (7D/8,W/2)

$Y_{A,D}$ (D/2,7W/8)

(D,W)

(0, 0)   Active Area

$Y_{B,U}$ (D/2,W/8)

(D/4,W/4)

$Y_{B,L}$ (D/8,W/2)   Gray 0 $Y_{B,R}$ (7D/8,W/2)

(3D/4,3W/4)

$Y_{B,D}$ (D/2,7W/8)   Gray 32

(D,W)

*7) Definition 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).

$$y = \gamma x - k$$

LOG(△Y)

LOG（Gray Level）
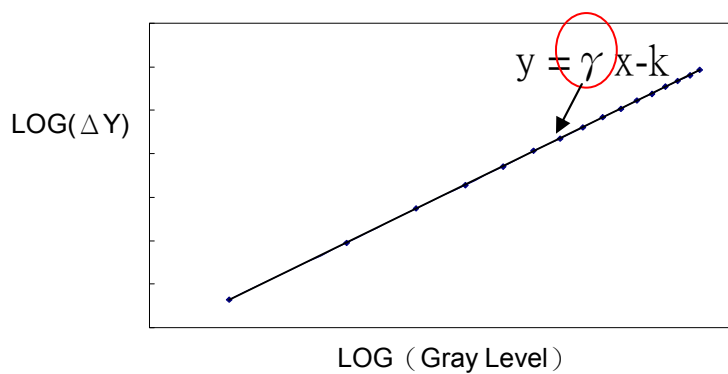
9. RELIABILITY TEST CONDITIONS

(A) Temperature and humidity

TEST ITEMS	CONDITIONS	NOTE
Low Temperature Storage	-30°C ；250Hrs	
High Temperature Storage	65°C ；250Hrs	
Low Temperature Operation	0°C ；250Hrs	
High Temperature Operation	50°C ；250Hrs	
High Temperature High Humidity Operation	40°C ；95％RH MAX ；250Hrs	
Thermal Shock	-40°C (0.5Hr)～65°C (0.5 Hr)，Ramp<20℃,100 Cycles	

(B) Shock and Vibration

TEST ITEMS	CONDITIONS
Shock	250G、2ms(half sin wave)、±X、±Y、±Z one time in each axis
Vibration	1.5G、5~500Hz、0.5 Octave/min、1Hr in each +/-X、+/-Y、+/-Z

(C) ESD

ITEM	CONDITION	NOTE
ESD	200 pF，0Ω，±200V (Contact mode)	*1)
	150 pF，330Ω，±8 & 15KV (Air mode)	*2)

.【Note】
*1) LCD glass and metal bezel
*2) IF connector pins

(D) 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-uniform, or line defect.