Chunghwa Picture Tubes, Ltd.
Technical Specification

To : **S.C.L**
Date : 2009/11/04

CPT TFT-LCD
CLAA116WA03A

Accepted by:
(Tentative version)

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Modification Record List

NO.	Issue Date	Modification Index
1	2009/06/23	The tentativeversion

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1. OVERVIEW

CLAA116WA03A 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
Gamut	42％(Min)45％(Typ)
Optimum Viewing Angle	6 o’clock
Response Time (ms)	10ms(Typ.)
Surface Treatment	Glare type
Viewing Angle	45°、45° /15°、30° (Typ.)
Brightness (cd/m^2)	200 (5point) (Typ) 180 (5point) (Min)
Uniformity	5point：80％(Min) 13point：70％(Min)
Consumption of Power (W)	3.6（Max）
Module Size (mm)	278.5x168x3.6 (Max)
Module Weight (g)	235 (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 Drive Input Voltage	VBL+	0	21	V	
Operation Temperature	Top	0	50	℃	*1).*2).* 3).*4)
Storage Temperature	Tstg	-25	65	℃	*1).*2).*3)

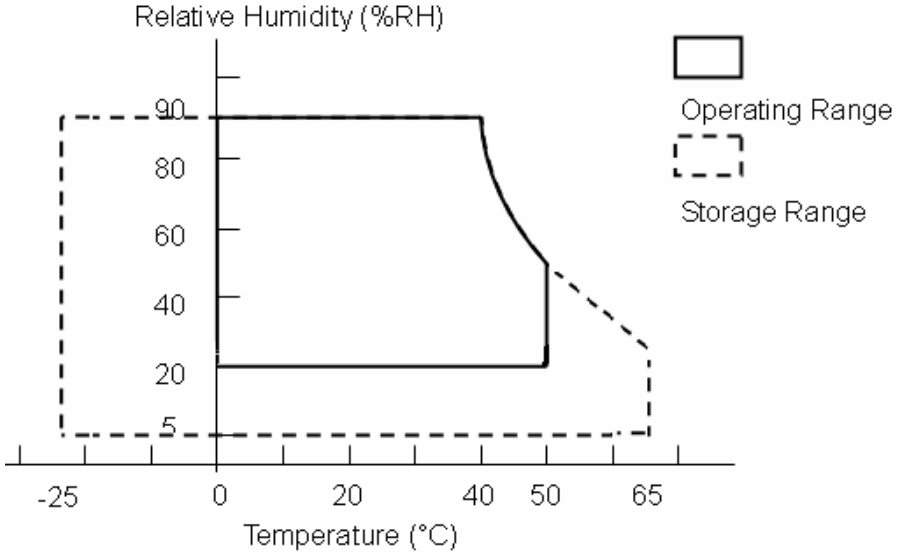
【Note】

*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	-	350	400	mA	*2)
Rush Current		Irush	-	-	1	A	*4)
Logic Input Voltage (LVDS: IN+,IN-)	Common Voltage	VCM	1.08	1.2	1.32	V	*3)
	Differential Input Voltage	| VID |	250	350	450	mV	*3)
	Threshold Voltage(HIGH)	VTH	-	-	100	mV	*3) When VCM = +1.2V
	Threshold Voltage(LOW)	VTL	-100	-	-	mV	

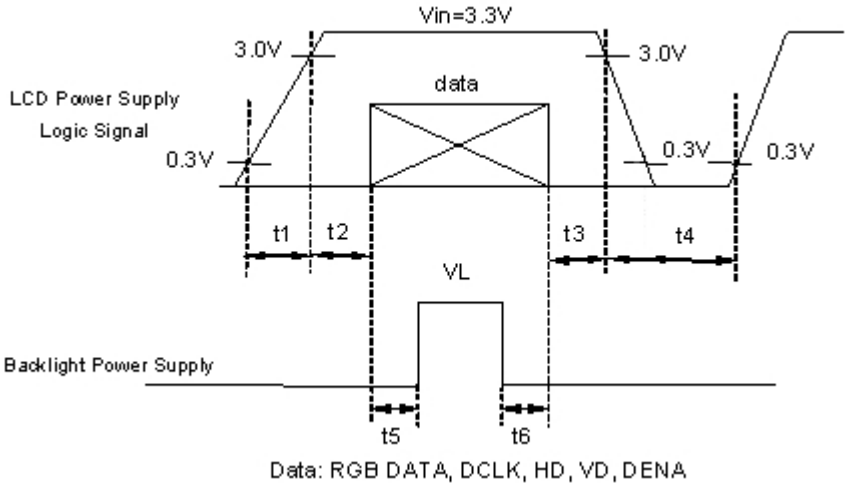
【Note】

*1) Power Sequence：

0.5 ms ≦t1≦10ms　　500 ms≦t4

0.01 ms＜t2≦50 ms　　200 ms≦t5

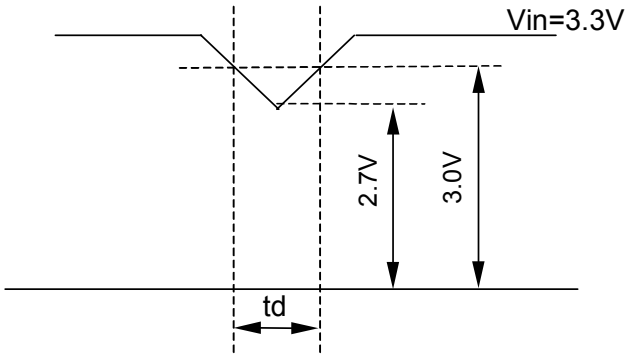
0.01 ms＜t3≦50 ms　　200 ms≦t6



VCC-dip state

(1)when 3.0＞VCC≧2.7V，td≦10 ms

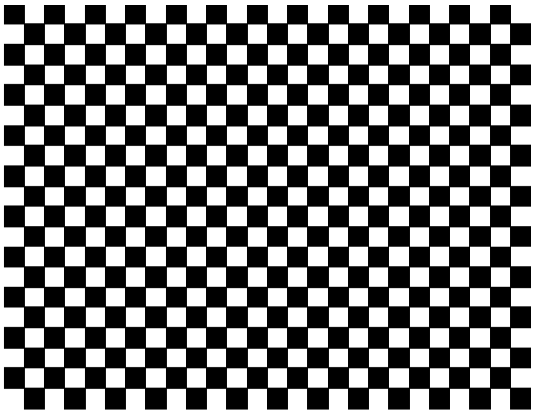
(2)when VCC＜2.7V，VCC-dip condition should as the VCC-turn-off condition.



*2) Typical value is Mosaic (32*36 Checker board) Pattern：768 line mode。

Circuit condition (Typ.)：

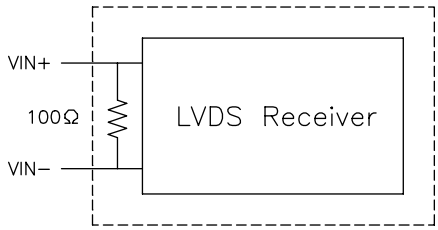
VCC=3.3 V，f_V=60 Hz f_H=48.36 kHz，f_{CLK}=75.44 MHz

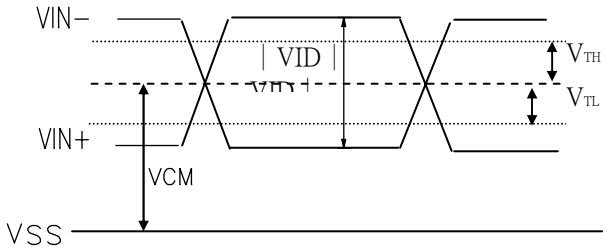


Max value is Black Pattern：768 line mode。

Circuit condition (Max.)：VCC=3.3 V，f_V=60 Hz f_H=48.36 kHz，f_{CLK}=75.44 MHz

*3) LVDS Signal Definite：

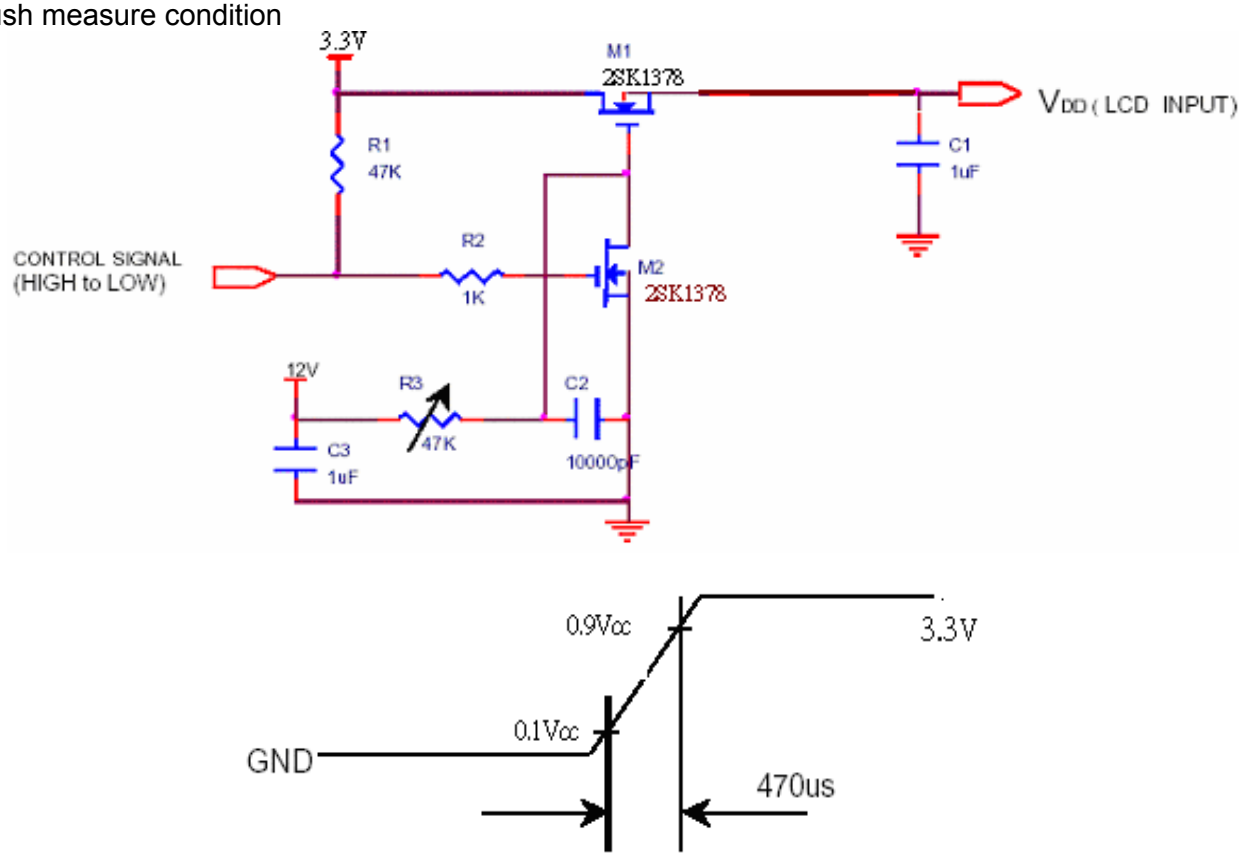




VIN+：Positive differential DATA & CLK Input

VIN-： Negative differential DATA & CLK Input

*4) Irush measure condition



(B) BACK LIGHT

(a.) ELECTRICAL CHARACTERISTICS

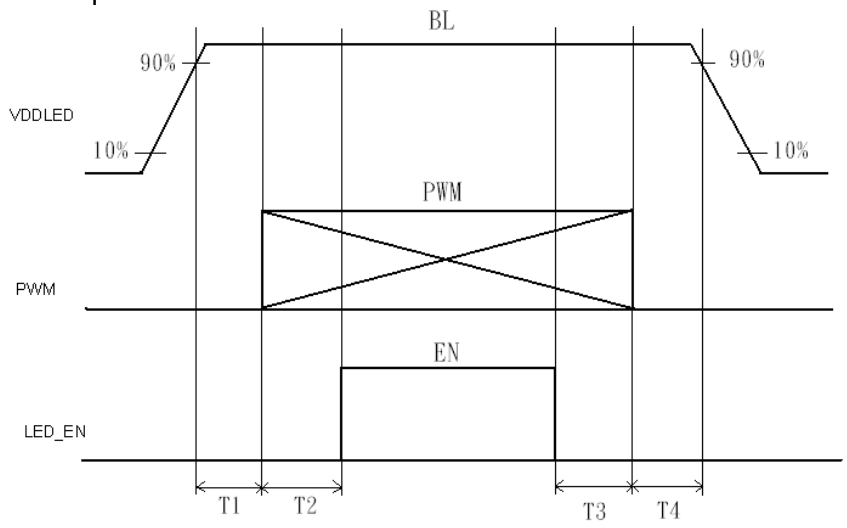
Ta=25℃

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LED Driver Input Voltage	VBL+	5	12	21	V	
LED Driver Input Current	IBL+	-	-	550	mA	*1)
Forward Voltage	V_F	3.0	3.2	3.5	V	*2)I_F=20mA
Forward Current	I_F	(19.5)	20	(20.5)	mA	*2)
Power consumption	PLED	-	(2.0)	(2.6)	W	*2)*3)
PWM Frequency	PWM_BL	180	200	1k	Hz	
Duty ratio	Dim	10	-	100	%	

(b) LED LIFE – TIME

ITEM	Condition	min	typ	max	UNIT	NOTE
LIFE TIME	I_F=20mA、Ta=25℃	15000	-	-	hrs	*4)

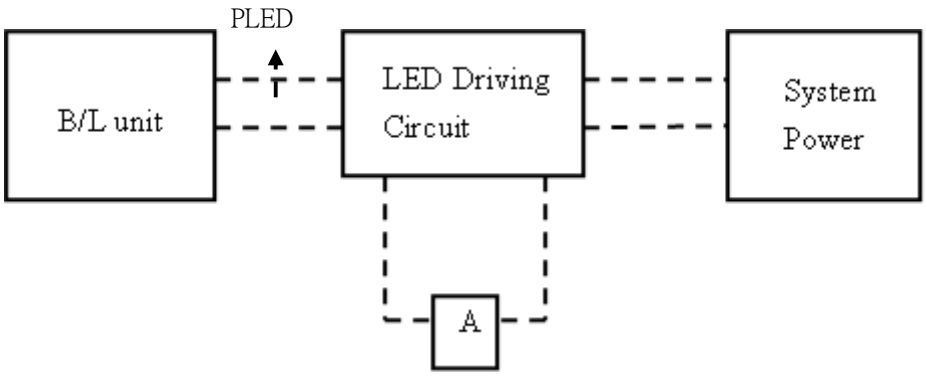
(c) LED ON/OFF Sequence：



10ms ≦ T1　　0ms ≦ T3
10ms ≦ T2　　10ms ≦ T4

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

*1) Maximum LED Driver Input Current at 5.0V 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.



*3) Calculator value for reference I_F*V_F*N=PLED
*4)Life time means that estimated time to 50% degradation of initial luminous intensity.

4. Connector Interface PIN & Function

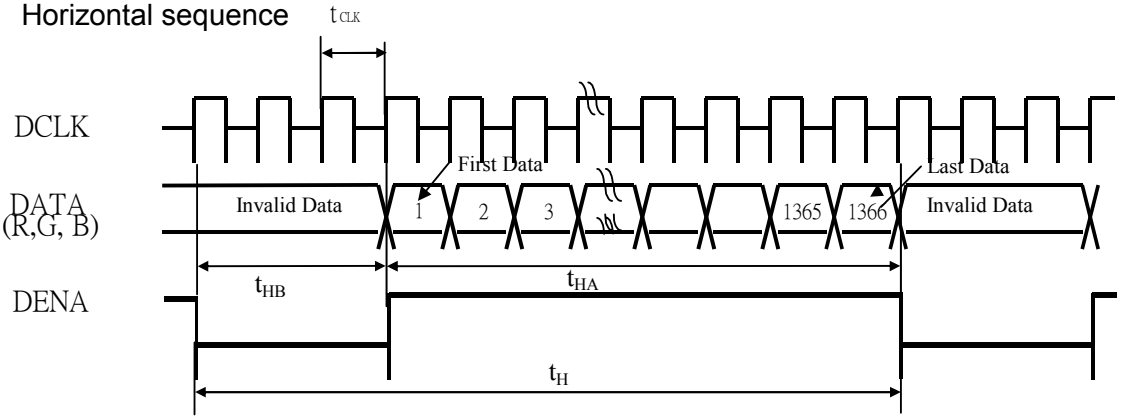
CN(Interface signal)

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

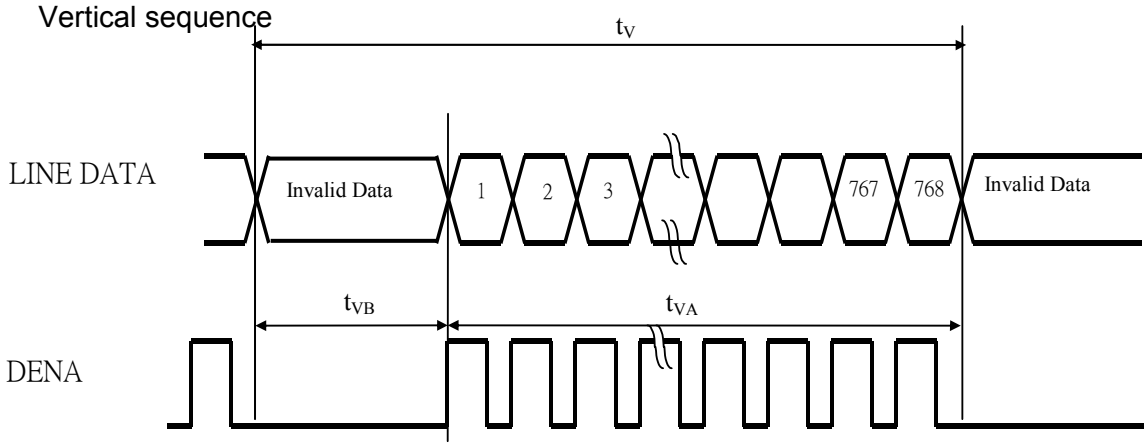
Pin No.	SYMBOL	FUNCTION
1	NC	No Connection (Reserved)
2	AVDD	Power Supply, 3.3V (typical)
3	AVDD	Power Supply, 3.3V (typical)
4	DVDD	DDC 3.3V power
5	NC	No Connection
6	SCL	DDC Clock
7	SDA	DDC Data
8	Rin0-	- LVDS differential data input (R0-R5, G0)
9	Rn0+	+ LVDS differential data input (R0-R5, G0)
10	GND	Ground
11	Rin1-	- LVDS differential data input (G1-G5, B0-B1)
12	Rn1+	+ LVDS differential data input (G1-G5, B0-B1)
13	GND	Ground
14	Rin2-	- LVDS differential data input (B2-B5,HS,VS, DE)
15	Rn2+	+ LVDS differential data input (B2-B5,HS,VS, DE)
16	GND	Ground
17	ClkIN-	- LVDS differential clock input
18	ClkIN+	+ 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/XL	Ground /Horizontal termical (left side)
26	NC/YD	No Connection /Vertical terminal (down side)
27	NC/XR	No Connection /Horizontal termical (right side)
28	GND/YU	Ground/Vertical terminal (up side)
29	NC	No Connection
30	NC	No Connection
31	VBL-	LED Ground
32	VBL-	LED Ground
33	VBL-	LED Ground
34	NC	No Connection (Reserved)
35	BLIM	PWM for luminance control (200~1KHz, 3.3V, 10~100%, 0V=off) / 5V tolerant
36	BL_Enable/NC	BL On/Off (On: 2.0~3.3V, Off: 0~0.5V) / NC (100K pull-up) / 5V tolerant
37	NC	No Connection
38	VBL+	LED Power Supply 5V~21V
39	VBL+	LED Power Supply 5V~21V
40	VBL+	LED Power Supply 5V~21V

5. INTERFACE TIMING CHART

(1)(a). LVDS input time sequence



(b) LCD input time sequence



(2) Timing Chart

ITEM				SYMBOL	MIN	TYP	MAX	UNIT
LCD Timing	Frame Rate			-	(55)	60	(65)	Hz
	DCLK		Frequency	f_{CLK}	(69.93)	75.4	(81.01)	MHz
			Period	t_{CLK}	(14.3)	13.33	(12.49)	ns
	DENA	Horizontal	Horizontal total time	t_H	(1498)	1560	(1570)	t_{CLK}
			Horizontal Active time	t_{HA}	1366	1366	1366	t_{CLK}
			Horizontal Blank time	t_{HB}	(132)	194	(204)	t_{CLK}
		Vertical	Vertical total time	t_V	(778)	806	(860)	t_H
			Vertical Active time	t_{VA}	768	768	768	t_H
			Vertical Blank time	t_{VB}	(10)	38	(92)	t_H

【Note】

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

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

(3) DATA mapping

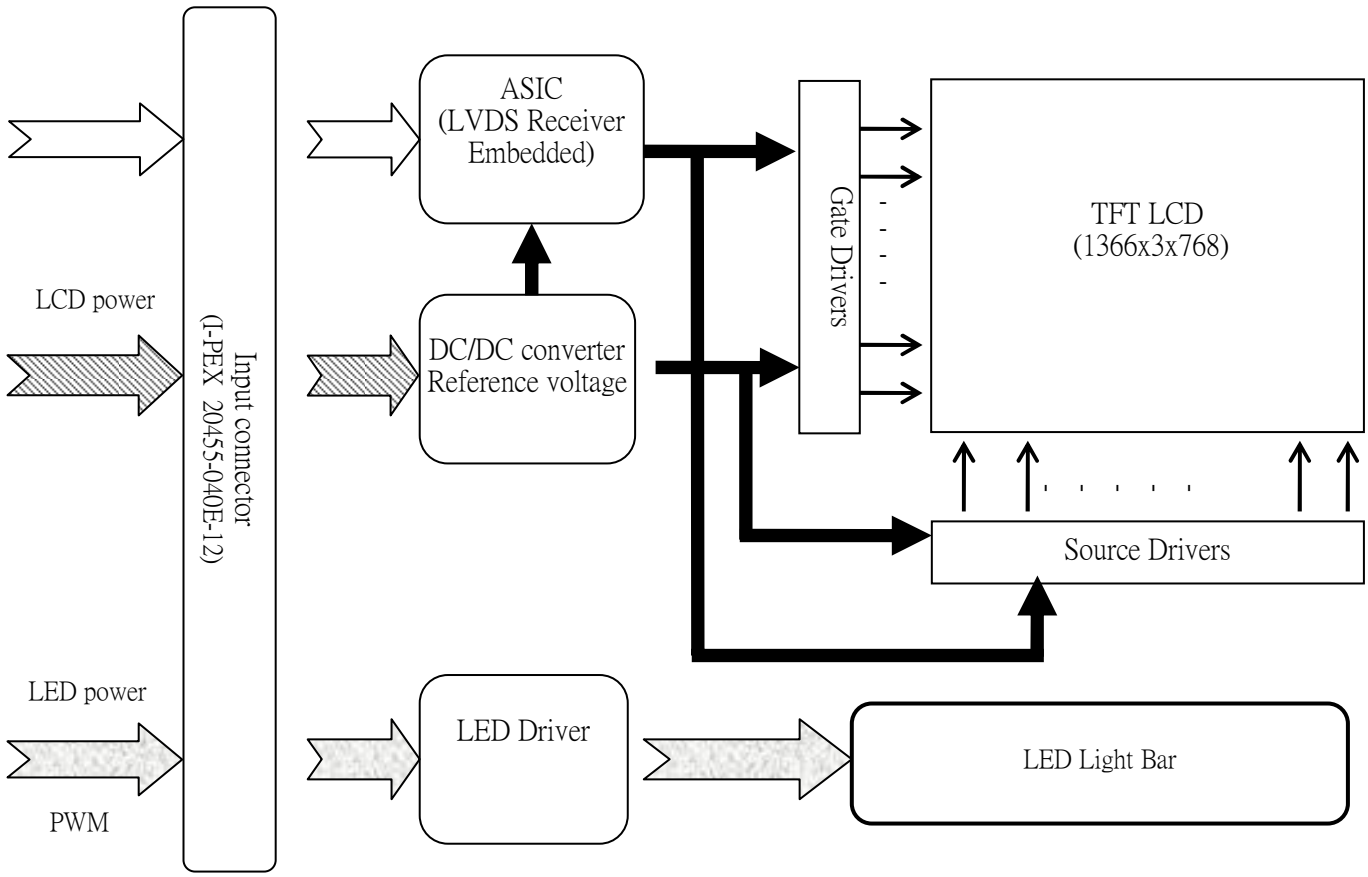
Color	Input Data	R DATA						G DATA						B DATA					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
		MSB					LSB	MSB					LSB	MSB					LSB
Basic Color	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue(63)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

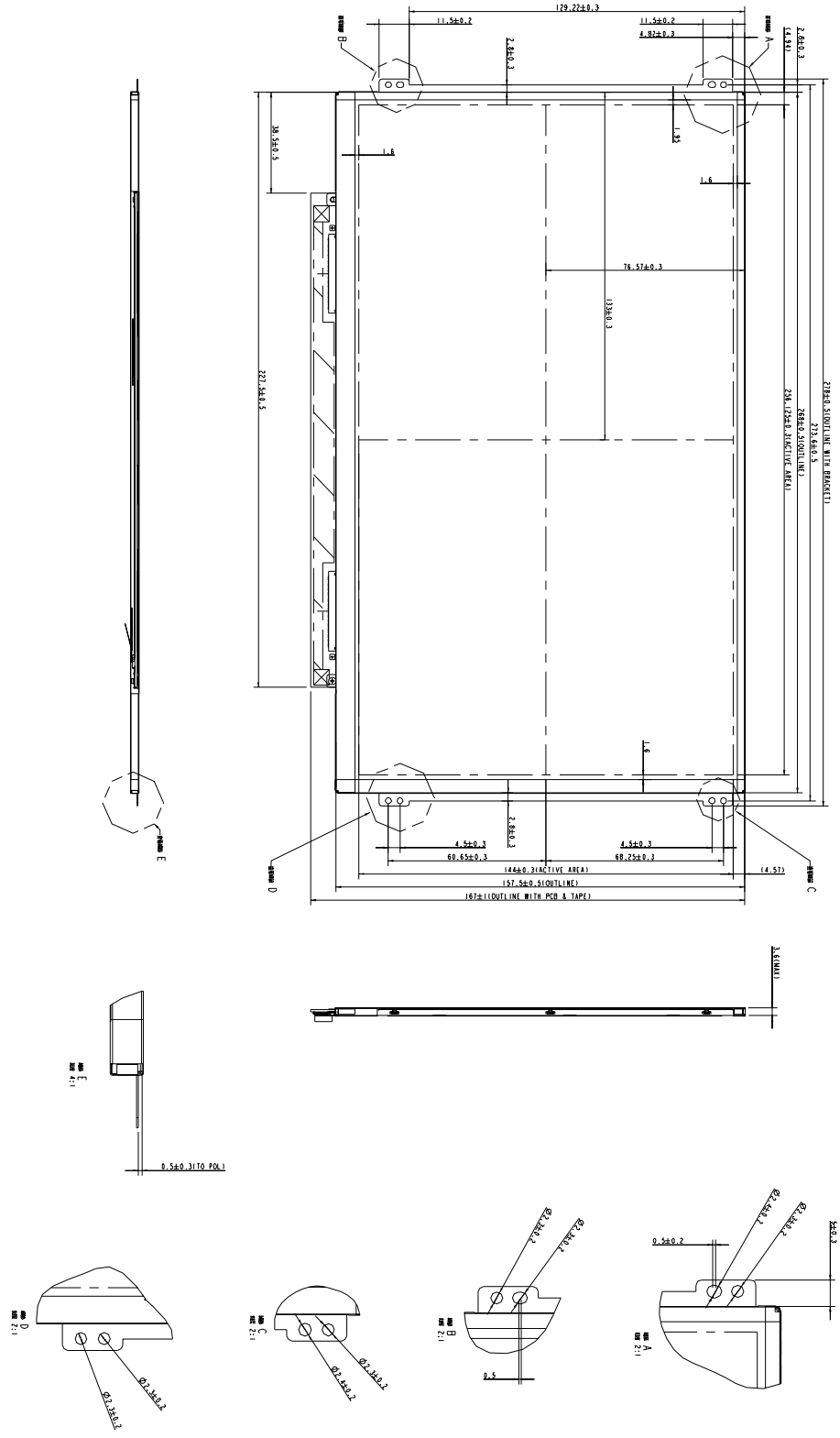
6. BLOCK DIAGRAM



7. MECHANICAL SPECIFICATION

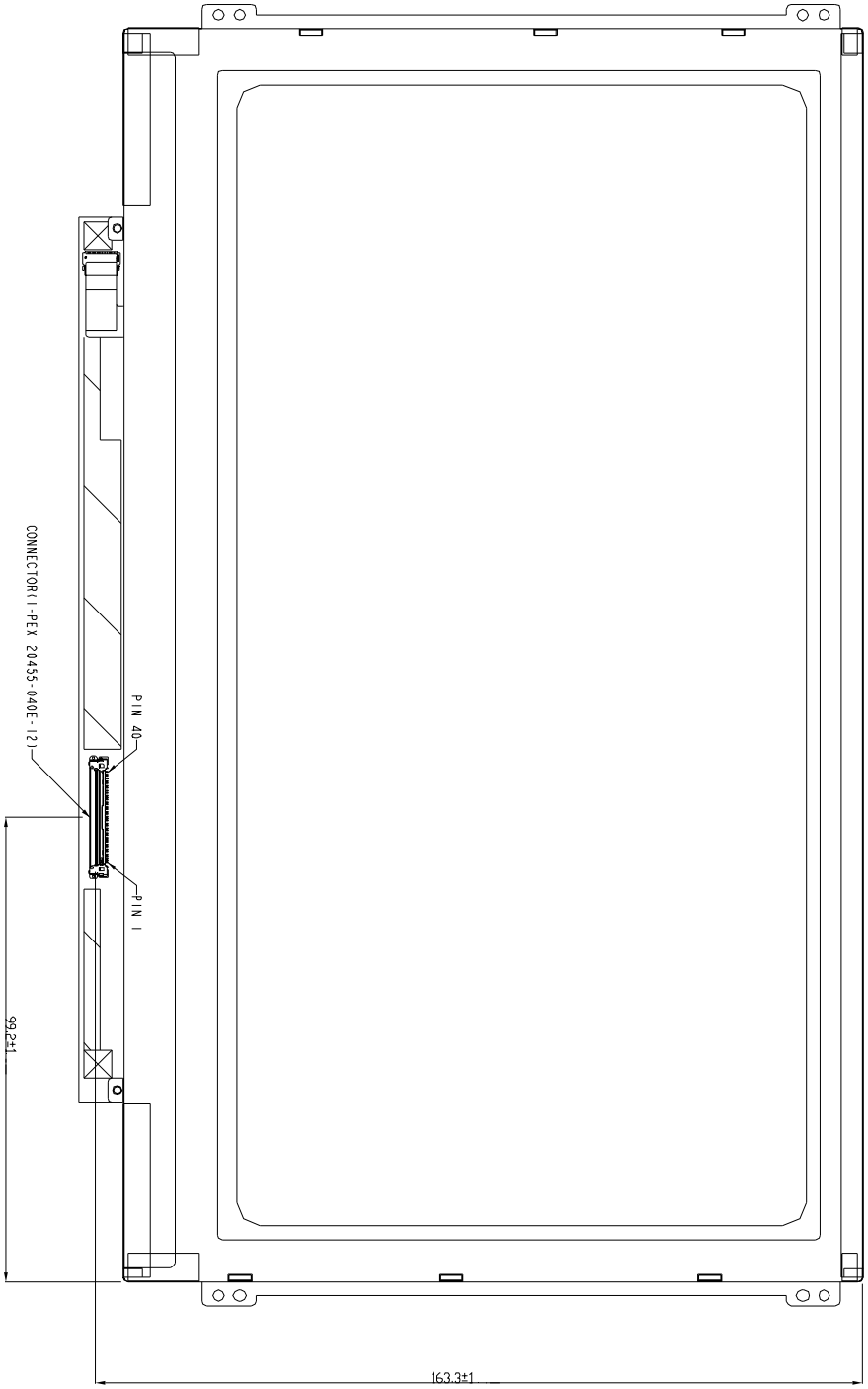
(1) Front side

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	θ=ψ= 0°	400	500	-	--	*1),*2)
Luminance (5P)		L	θ=ψ= 0°.	180	200	-	cd/m^2	*1),*3)
Uniformity(5P)		ΔL	θ=ψ= 0°	80	-	-	%	*1),*3)
Response Time		Tr	θ=ψ= 0°	-	10	12	ms	*5)
		Tf	θ=ψ= 0°					
Cross talk		CT	θ=ψ= 0°	-	-	1	%	*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=20mA(each LED)

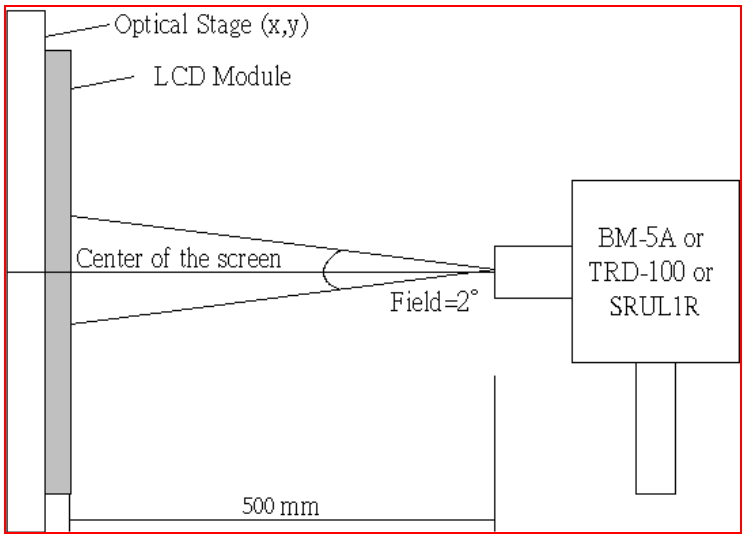
Definition of these measurement items is as follows:

***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%**

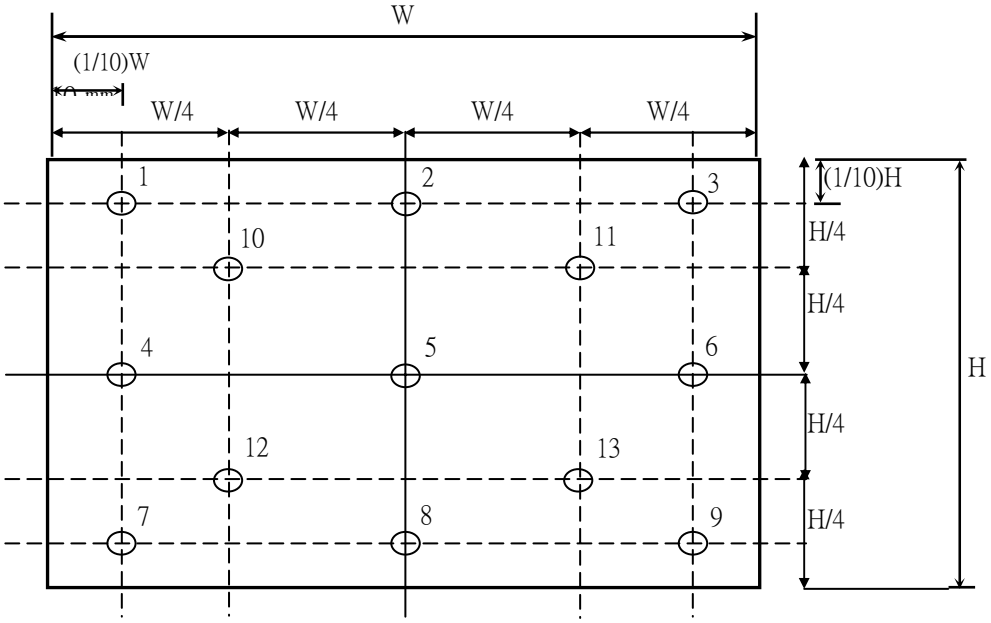
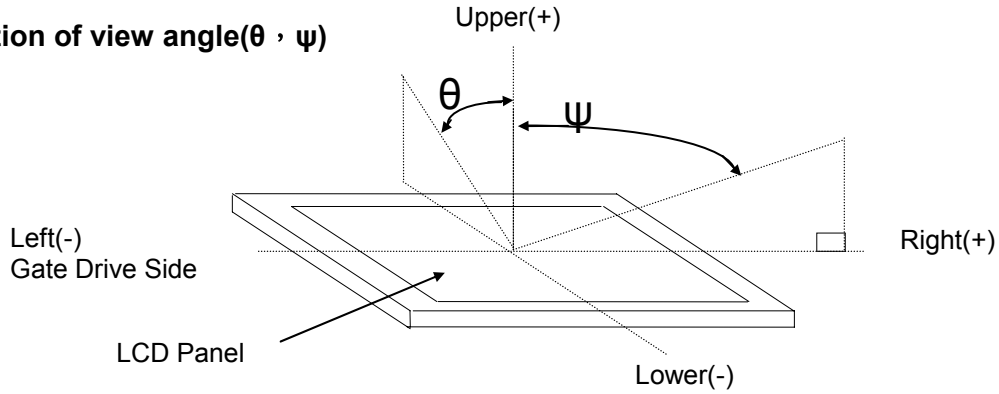
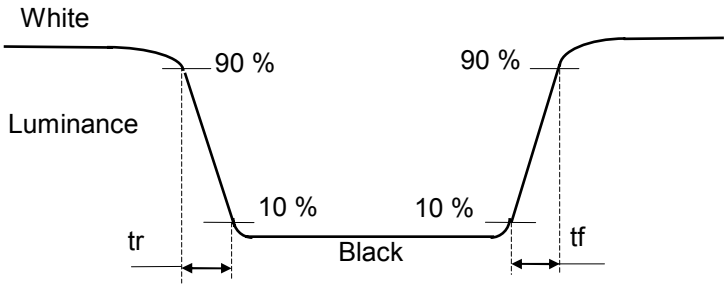


Fig.1 Measure point (Active area)

***4) Definition of view angle(θ，ψ)**



***5) Definition of response time**



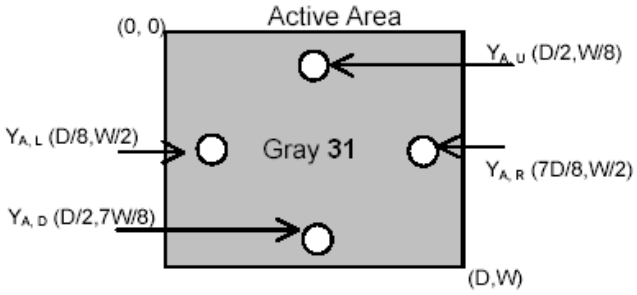
***6) Crosstalk Modulation Ratio:**

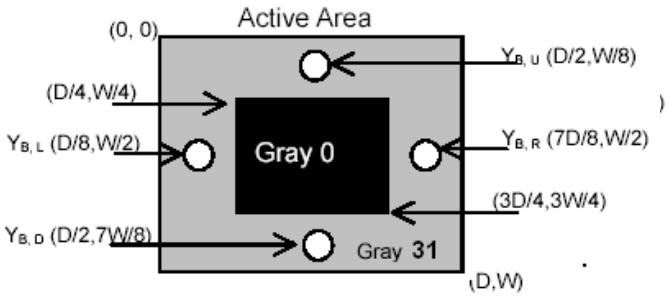
CT= | Y_B-Y_A | / Y_A× 100%

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)



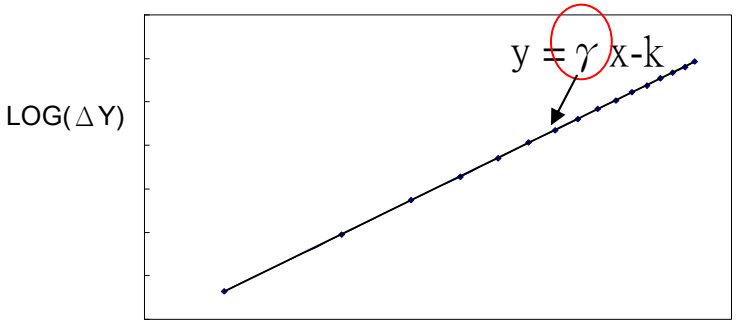


***7) Definition Gamma (VESA)**

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).



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；250Hrs
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 and Vibration

TEST ITEMS	CONDITIONS
Shock (Non-Operation)	220G, 2ms, half sin wave, ± X,± Y,± Z 1time each
Vibration (Non-Operation)	Vibration level : 14.7m/s^2 (1.5G), sinusoidal wave (each x, y, z axis : 1hr, total 3hrs) Frequency range : 5～500 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	±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.