Chunghwa Picture Tubes, Ltd.
Technical Specification

CPT TFT-LCD

CLAA070WP03

APPROVED BY	CHECKED BY	PREPARED BY

Doc. No:	CLAA070WP03-Tentative	Issue Date:	2012/03/05

CHUNGHWA PICTUER TUBES, LTD.

TECHNICAL   SPECIFICATION

Doc. No： CLAA070WP03
Version： Tentative
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Title：CLAA070WP03   Technical Specification

Modification Record List

NO.	Issue Date	Modification Index
1	2012/03/05	First Edition

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1. OVERVIEW

CLAA070WP03 is 7"　color 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, 800×RGB (3) ×1280, 16.7M-color images are displayed on the 7"　diagonal screen. general specifications are summarized in the following table：

ITEM	SPECIFICATION
Display Area	94.2(H)x150.72(V) (mm) (7-inch diagonal)
Number of Pixels	800 ×3(H)×1280 (V)
Pixel Pitch	0.11775(H)×0.11775(V) (mm)
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally Black
Number of Colors	16.7M(6bits + Hi-FRC)(LVDS)
Gamut	60%(Typ)
Optimum Viewing Angle	whole view
Response Time	50ms (Max)
Surface Treatment	HC , Hardness：3H
Viewing Angle(CR>10)	85°、85° / 85°、85°(Min)
Brightness	450 cd/m^2 (5points, average) (Typ)
Uniformity	9point：80 %(Typ.)
Consumption of Power	0.5 (LCD Module Typical)/ 1.692 (Backlight Typical)
Module Size	161.67(H)×104.32(V)×3.85(D) (Typ.)
Module Weight	101g (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.
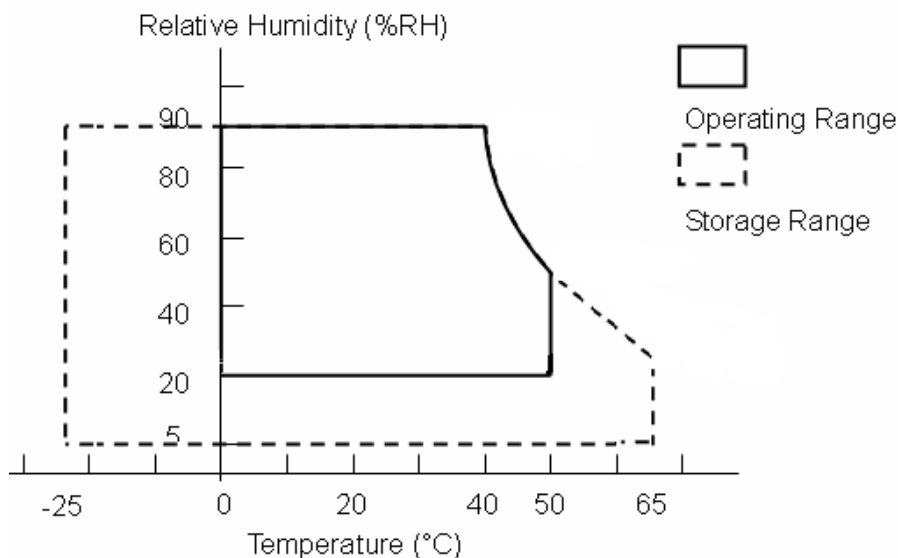
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2. ABSOLUTE MAXIMUM RATINGS

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	VDDI	0	4.5	V	
	VCCI	0	2	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℃.

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3. ELECTRICAL CHARACTERISTICS
(A) TFT LCD

TEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Power Voltage	VDDI	3	3.3	3.6	V	*1)
	VCCI	1.7	1.8	1.9	V	
LCD Power Current	IDD	-			mA	*2)
	ICC	-			mA	
Rush Current	Irush	-	-	2	A	*4)

【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

data:RGB DATA, DCLK, HD, VD, DENA
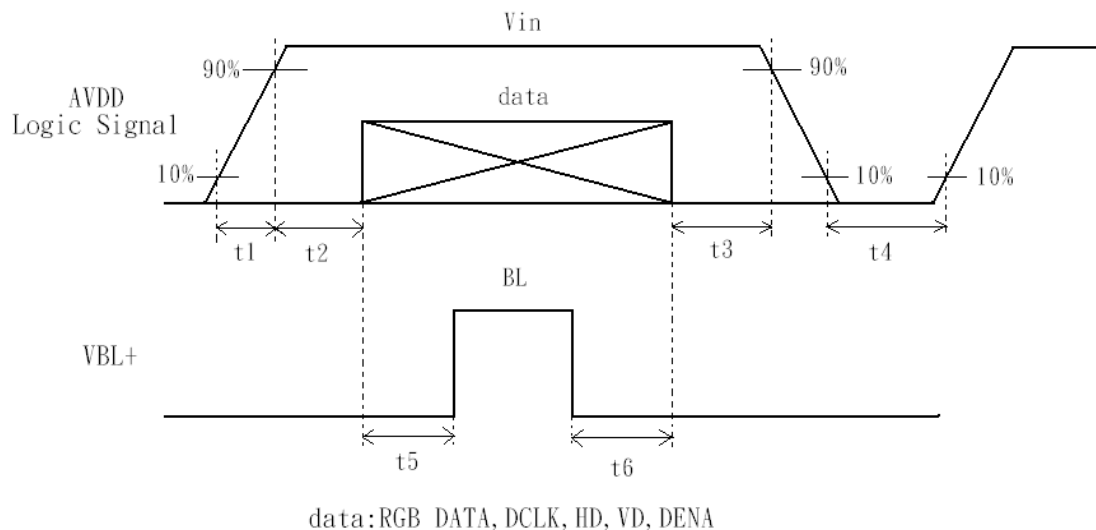
Vin-dip state

(1)when 3.0V＞Vin≧2.7V，td≦10 ms.

(2)when Vin＜2.7V，Vin-dip condition should as the Vin-turn-off condition.
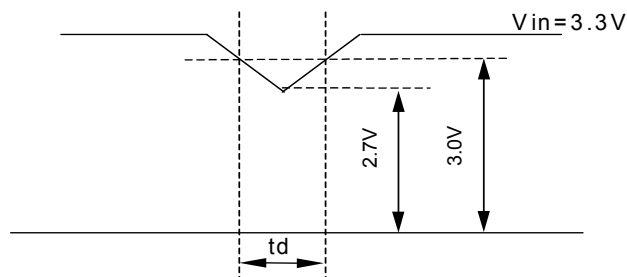
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*2) Max value is White Pattern：1280 line mode。
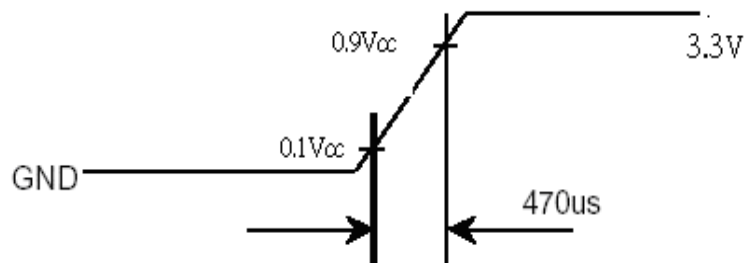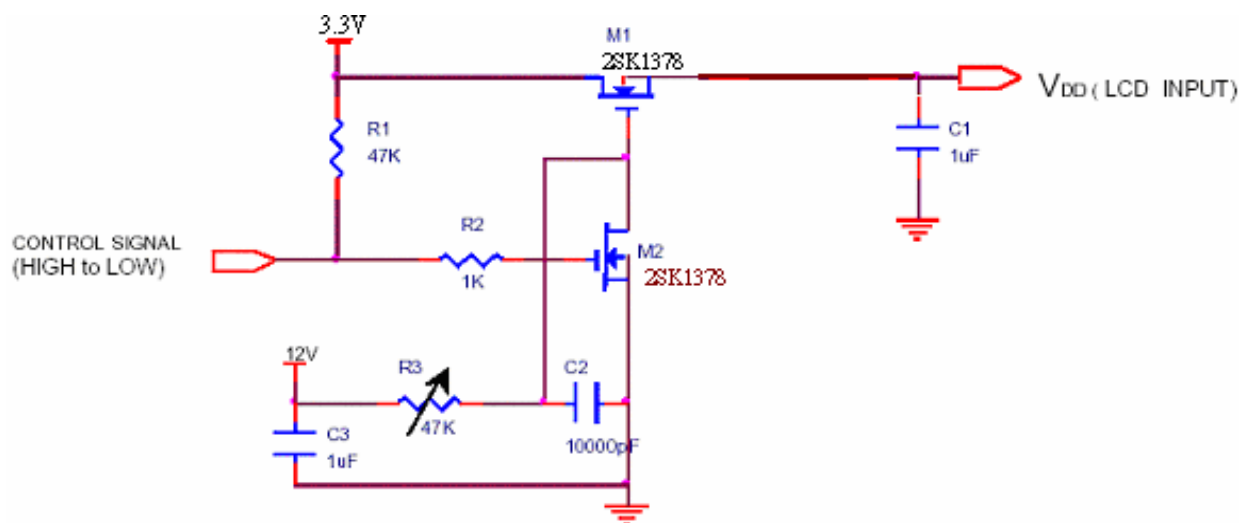
Circuit condition (Max.)：VDDI=3.3 V，f_V=60 Hz，f_H=51.84 kHz，f_{CLK}=66.77 MHz

*3) Irush measure condition

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(B) BACK LIGHT

(a.) ELECTRICAL CHARACTERISTICS

Ta=25℃

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LED Driver Iuput Voltage	VBL+	13	15	16.5	V	
LED Driver Input Current	IBL+	-	95	-	mA	*1)
Forward Voltage	VF		2.85	3	V	*2)I$_F$=19mA
Forward Current	IF	-	19	-	mA	
Power consumption	PLED	-	1.692		W	*2)*3)I$_F$=19mA
PWM Frequency	PWM_BL	180	200	220	Hz	
Duty ratio	Dim	5		100	%	

(b) LED LIFE － TIME

ITEM	Condition	min	typ	max	UNIT	NOTE
LIFE TIME	IF=20mA、Ta=25℃	10000	x	x	hrs	*4)

(c) LED ON/OFF Sequence：
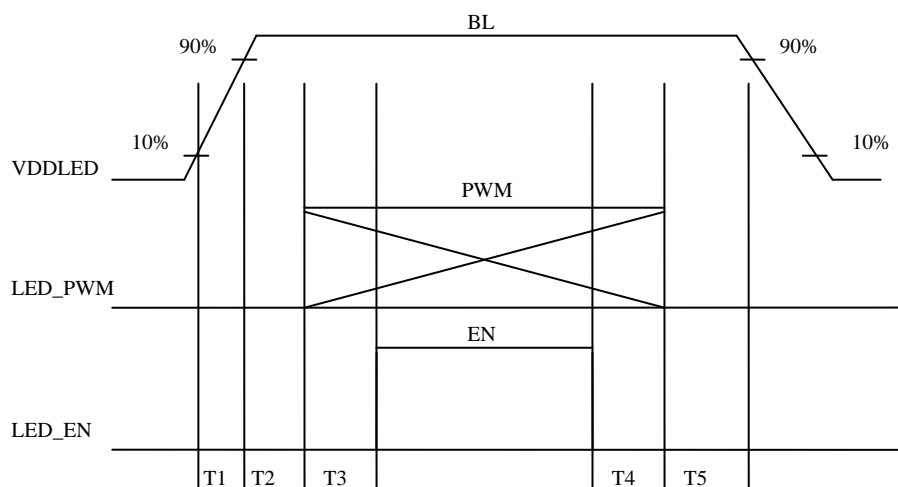
0.5ms ≦ T1 ≦ 10ms
10ms ≦ T2
10ms ≦ T3
0ms ≦ T4
10ms ≦ T5

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*1) Maximum LED Driver Input Current at 3 V 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 3.6V
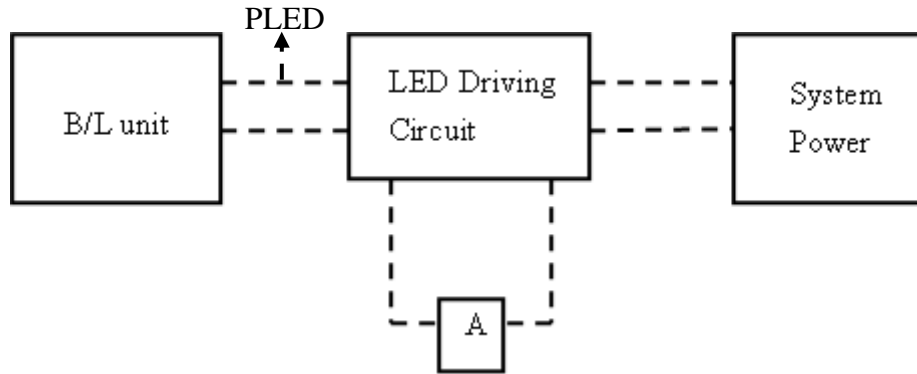
*3) Calculator value for reference $I_F \times V_F \times N /0.8 =$ PLED

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

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4. Connector Interface PIN & Function

CN(Interface signal)

Pin No.	SYMBOL	FUNCTION
1	GND	Ground
2	VDDI	Power Supply, 3.3V(Typical)
3	D0N	MIPI Input Data Pair
4	VDDI	Power Supply, 3.3V(Typical)
5	D0P	MIPI Input Data Pair
6	VDDI	Power Supply, 3.3V(Typical)
7	GND	Ground
8	GND	Ground
9	D1N	MIPI Input Data Pair
10	VCCI	Power Supply, 1.8V(Typical)
11	D1P	MIPI Input Data Pair
12	VCCI	Power Supply, 1.8V(Typical)
13	GND	Ground
14	GND	Ground
15	CLKN	MIPI Input Clock Pair
16	LEN_EN2	LEDON/LEDPWM Signal on/off Control
17	CLKP	MIPI Input Clock Pair
18	LED_PWM2	LED PWM Signal Pin
19	GND	Ground
20	LED_ON2	LED Enable Signal Pin
21	D2N	MIPI Input Data Pair
22	ANODE	LED Output
23	D2P	MIPI Input Data Pair
24	ANODE	LED Output
25	GND	Ground
26	CATHODE1	LED Feedback
27	D3N	MIPI Input Data Pair
28	CATHODE2	LED Feedback
29	D3P	MIPI Input Data Pair
30	CATHODE3	LED Feedback
31	GND	Ground
32	CATHODE4	LED Feedback

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33	BISTB	BIST Testing
34	CATHODE5	LED Feedback

5. INTERFACE TIMING CHART

(1)(a)MIPI Interface DC Characteristic

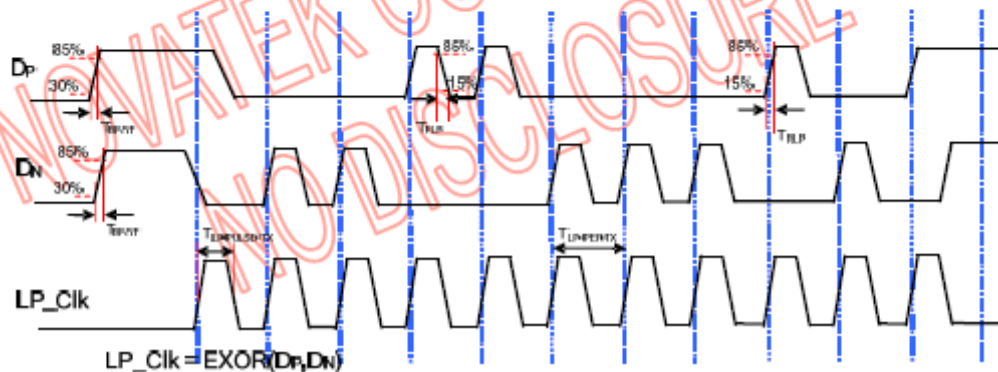| Parameter	Symbol	Min.	Typ.	Max.	Unit	Condition
MIPI Characteristics for High Speed Receiver						
Single-endedl input low voltage	V_{ILHS}	-40	-	-	mV	
Single-endedl input high voltage	V_{IHHS}	-	-	460	mV	
Common-mode voltage	V_{CMRXDC}	70	-	330	mV	
Differential input impedance	Z_{ID}	80	100	125	ohm	
Differential HS signal	$|V_{OD}|$	140	200	250	mV	$V_{OD}=V_{DP}-V_{DN}$
Single-end HS input low threshold	V_{IDTL}	-	-	-70	mV	$V_{DP}<V_{DN}$ refer to Figure42
Single-end HS input high threshold	V_{IDTH}	70	-	-	mV	$V_{DP}>V_{DN}$ refer to Figure42
MIPI Characteristics for Low Power Mode						
Pad signal voltage range	V_I	-50	-	1350	mV	
Ground shift	V_{GNDSH}	-50	-	50	mV	
Logic 0 input threshold	V_{IL}	0.0	-	550	mV	
Logic 1 input threshold	V_{IH}	980	-	1350	mV	
Input hysteresis	V_{HYST}	25	-	-	mV	
Output low level	V_{OL}	150	-	150	mV	
Output high level	V_{OH}	1.1	1.2	1.3	V	
Logic 0 contention threshold	$V_{ILCD,MAX}$	-	-	200	mV	
Logic 1 contention threshold	$V_{IHCD,MIN}$	450	-	-	mV	
MIPI Digital Operating Current	$I_{VDDMIPI}$	-	15	20	mA	VDD=3.3V, F_{DCLK}=480Mbps, Input pattern: 55h->AAh->55h->AAh
MIPI Digital Stand-by Current	I_{STMIPI}	-	-	180	uA	Clock & all Functions stopped
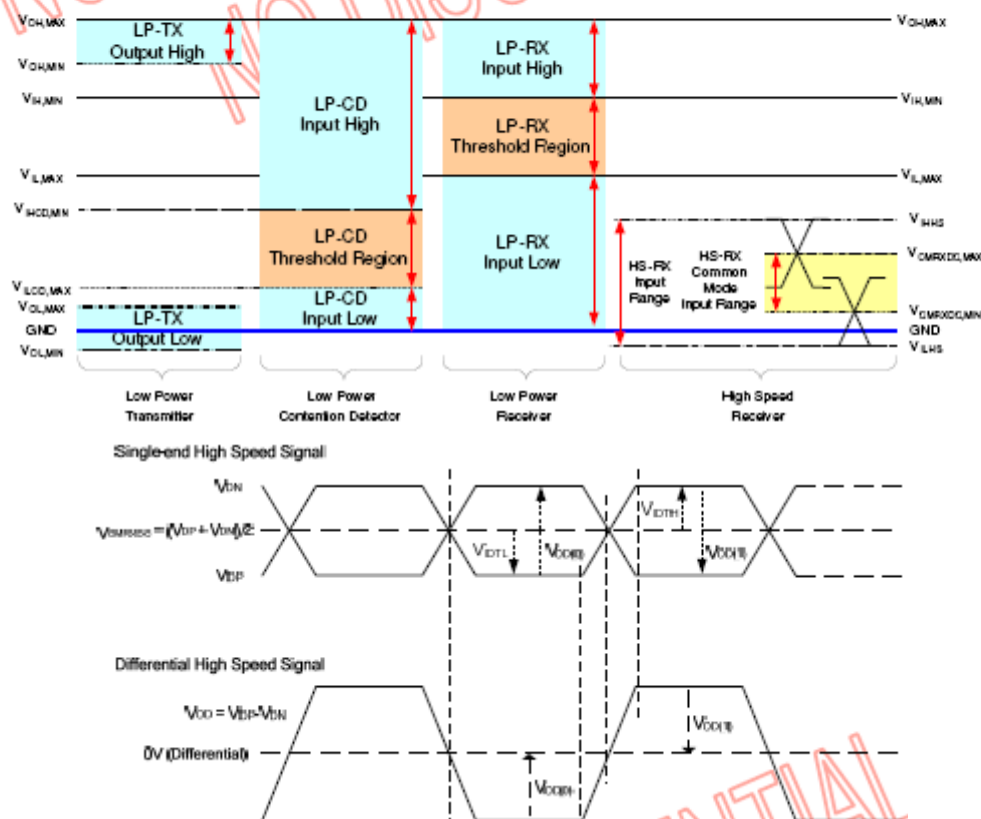
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(b) MIPI Interface AC Characteristic

Parameter		Symbol	Min	Typ	Max	Units
15%-85% rise time and fall time		T_{RLP} / T_{FLP}	-	-	35	ns
30%-85% rise time(from HS to LP)		T_{REOT}	-	-	35	ns
Pulse width of the LP exclusive-OR clock	First LP exclusive-OR clock pulse after STOP state or last pulse before stop state	$T_{LP-PULSE-TX}$	40	-	-	ns
	All other pulses		20	-	-	ns
Period of the LP exclusive-OR clock		$T_{LP-PER-TX}$	90	-	-	ns
Slew Rate@ C_{LOAD} = 0pF		$\delta V/\delta t_{SR}$	20	-	500	mV/ns
Slew Rate@ C_{LOAD} = 5pF			20	-	200	mV/ns
Slew Rate@ C_{LOAD} = 20pF			20	-	150	mV/ns
Slew Rate@ C_{LOAD} = 70pF			20	-	100	mV/ns
Load Capacitance		C_{LOAD}	-	-	70	pF

LP_Clk = EXOR(D$_P$,D$_N$)

(c)MIPI Initial Command→0x0D

Address (MIPI I/F)	AEh					Access Attribute			R/W
						Number of Parameter(s)			1
Parameter	D[7]	D[6]	D[5]	D[4]	D[3]	D[2]	D[1]	D[0]	Default Value
	0	0	0	0	RTREM_ENL	RTREM_ENR	SWDIV	1	0Fh
Description	**RTREM_ENL:** SDLOC = 1 driver IC terminal resistor disenable/enable selection. RTERM_ENL = L, Terminal resistor disable. RTERM_ENL = H, Terminal resistor enable. (default) **RTREM_ENR:** SDLOC = 0 driver IC terminal resistor disenable/enable selection. RTERM_ENR = L, Terminal resistor disable. RTERM_ENR = H, Terminal resistor enable. (default) **SWDIV:** Differential input impedance selection. SWDIV = L, Differential input impedance(Z$_{ID}$) is 200ohm. SWDIV = H, Differential input impedance(Z$_{ID}$) is 100ohm. (default)								
Restriction	-								

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(2) Timing Chart

ITEM			SYNBOL	MIN	TYP	MAX	UNIT
LCD Timing	Frame Rate		-	TBD	60	TBD	Hz
	DCLK	Frequency	f_{CLK}	TBD	66.77	TBD	MHz
	DENA	Horizontal	Horizontal total time	t_H	TBD	864	TBD	t_{CLK}
			Horizontal Active time	t_{HA}	TBD	800	TBD	t_{CLK}
			Horizontal Blank time	t_{HB}	TBD	64	TBD	t_{CLK}
		Vertical	Vertical total time	t_V	TBD	1288	TBD	t_H
			Vertical Active time	t_{VA}	TBD	1200	TBD	t_H
			Vertical Blank time	t_{VB}	TBD	8	TBD	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

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	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(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																			
	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
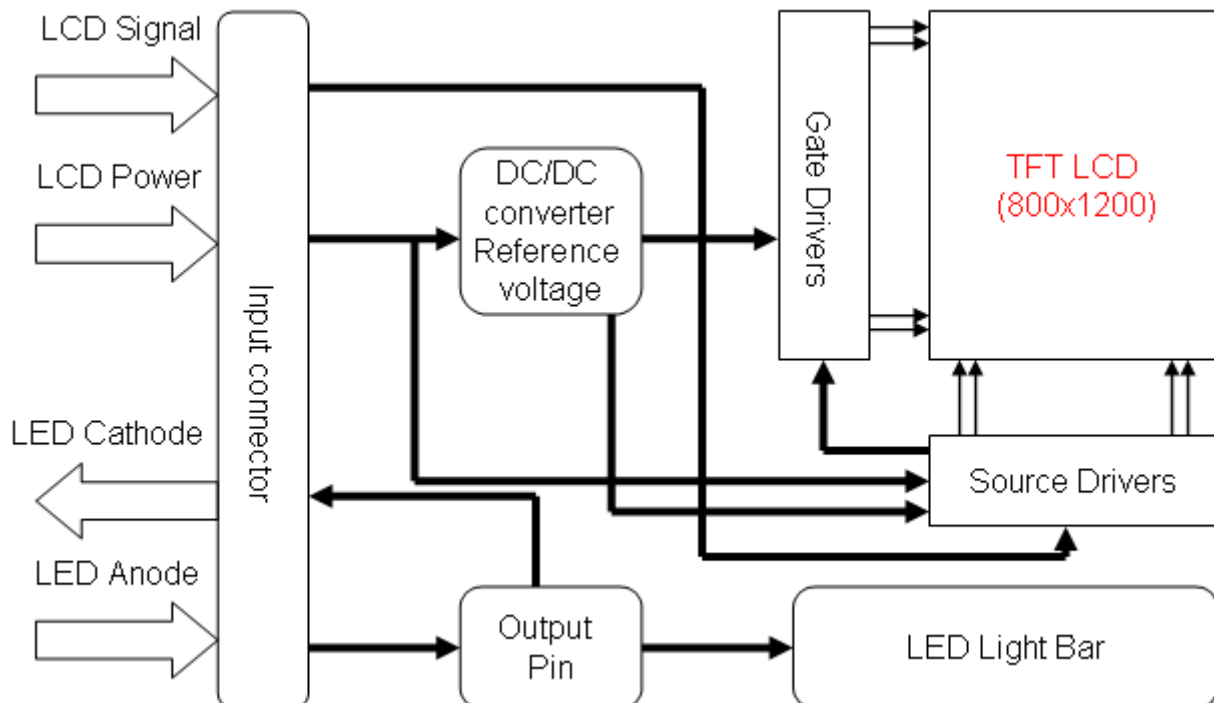
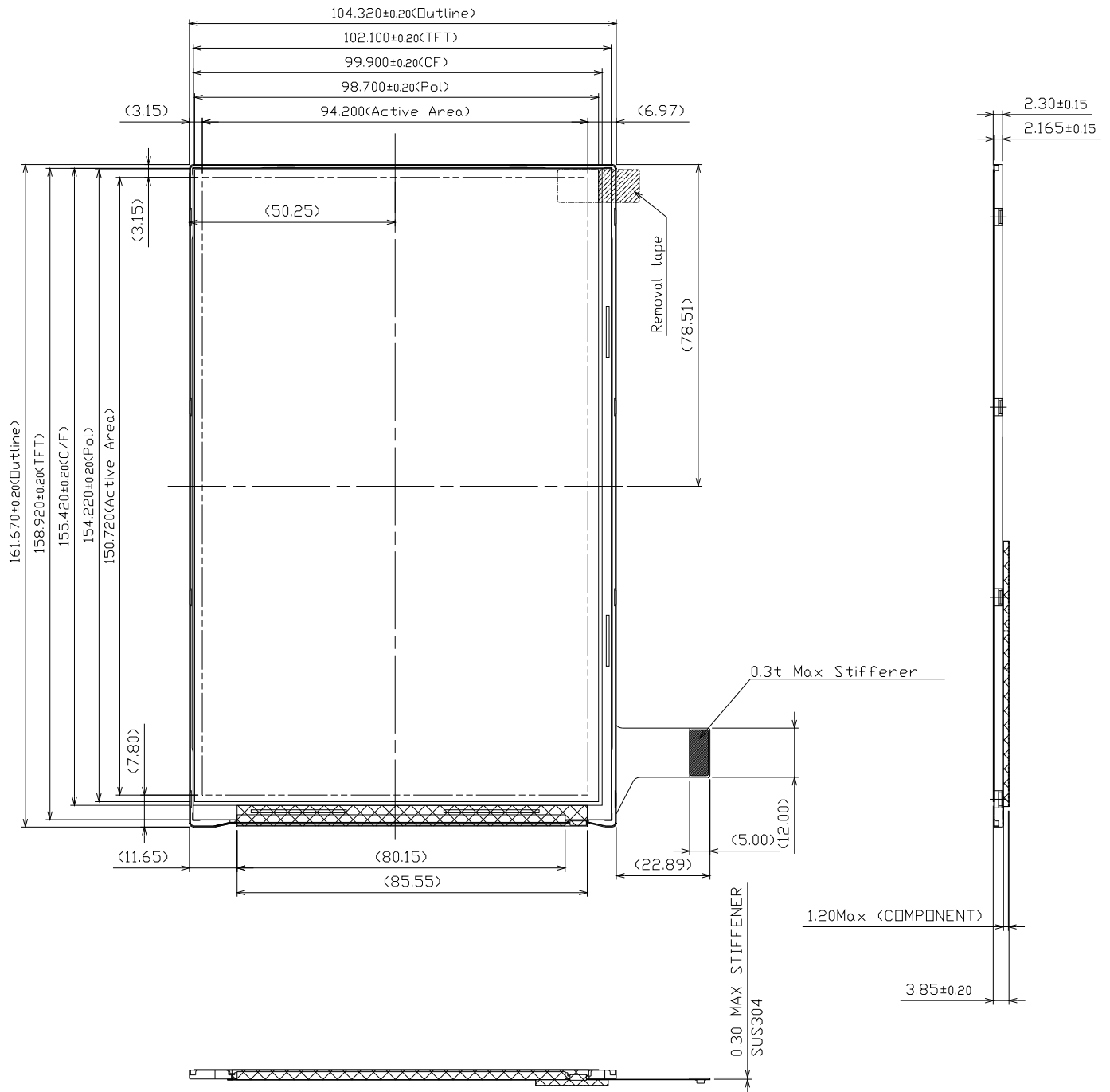Title：CLAA070WP03　　Technical Specification

7. MECHANICAL SPECIFICATION

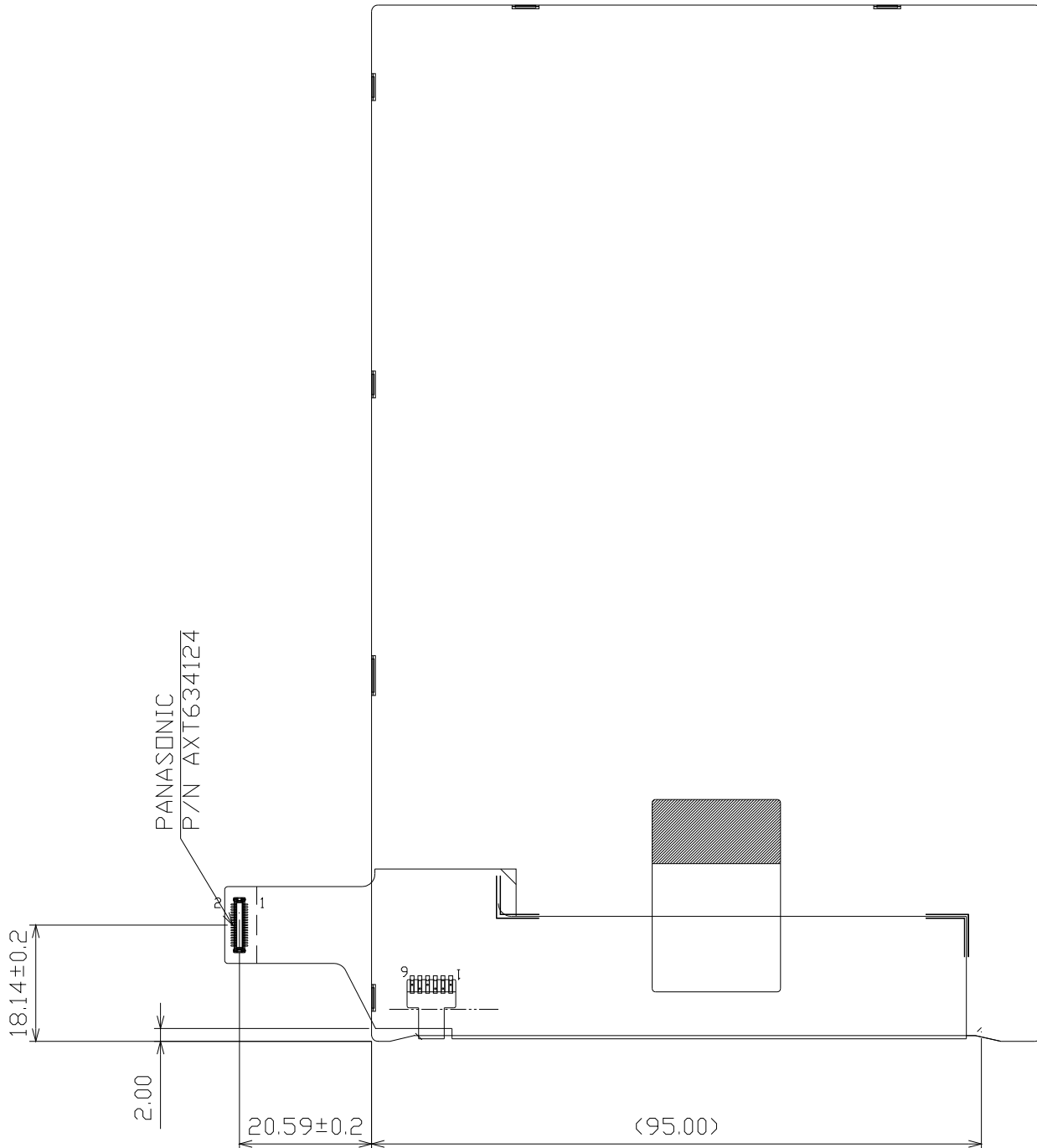(1) Front side

The tolerance, not show in the figure, is ±0.2mm. [Unit： mm]

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2) Rear side

The tolerance, not show in the figure, is ±0.2mm.   [Unit： mm]

PANASONIC
P/N AXT634124

18.14±0.2

2.00

20.59±0.2

（95.00）

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8. OPTICAL CHARACTERISTICS

Ta=25℃，VDD=3.3V

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast Ratio		CR	θ = φ = 0°	600	700	--	--	*1) 2)
Luminance (5P Average)		L	θ = φ = 0°	390	450	--	cd/m²	*1) 3)
Uniformity(9P)		ΔL	θ = φ = 0°	70	80	--	%	*1) 3)
Response Time		Tr+Tf	θ = φ = 0°	--	30	45	ms	*5)
Cross talk		CT	θ = φ = 0°	--	--	2	%	*6)
View angle	Horizontal	Ψ	CR≧10	80/-80	85/-85	--	°	View angle
	Vertical	θ		80/-80	85/-85	--	°	
Color Temperature Coordinate	W	X	θ = φ = 0°		0.310		--	Color Temperature Coordinate
		Y			0.330			
	R	X			-		--	
		Y			-			
	G	X			-		--	
		Y			-			
	B	X			-		--	
		Y			-			
Gamut			θ = φ = 0°	--	60	--	%	
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=19 mA(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.

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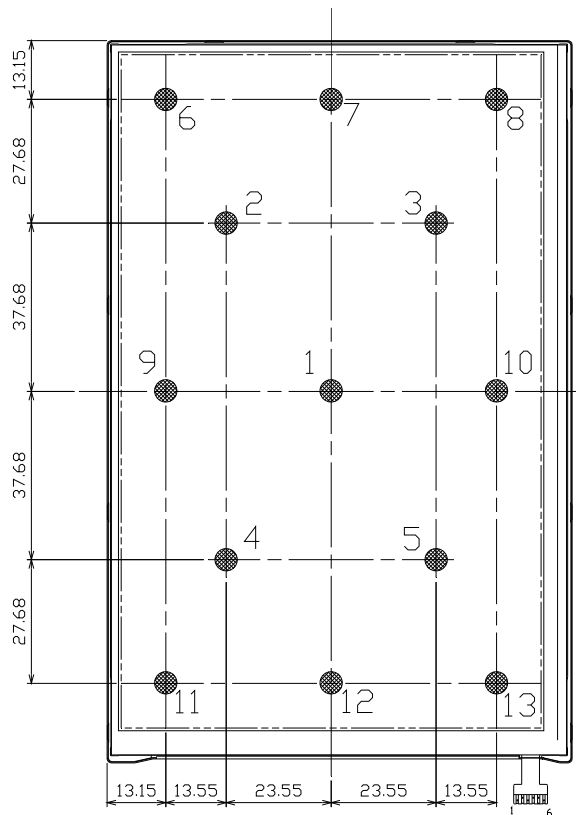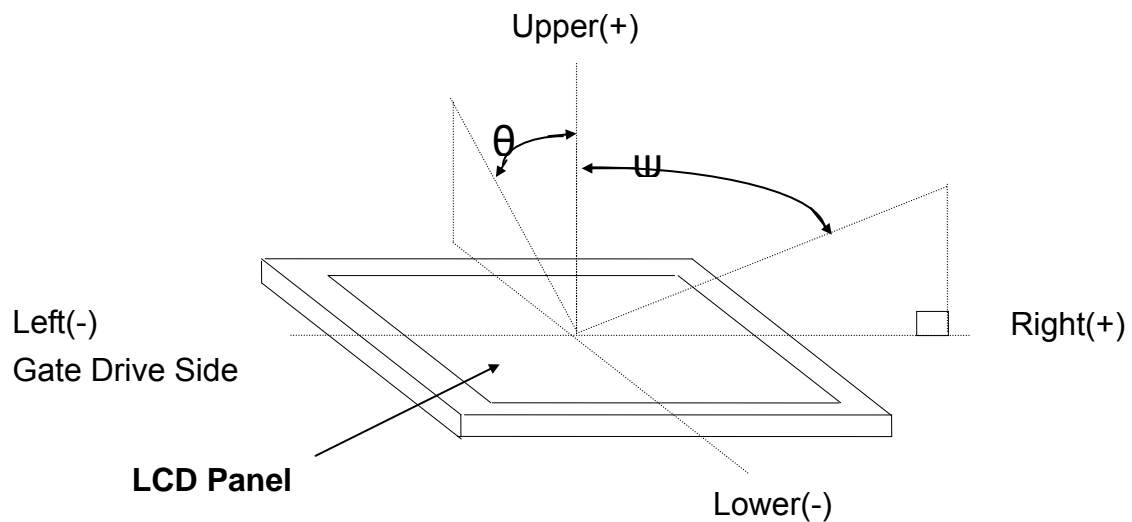
*2) Definition of Contrast Ratio

CR=ON (White) Luminance/OFF (Black) Luminance
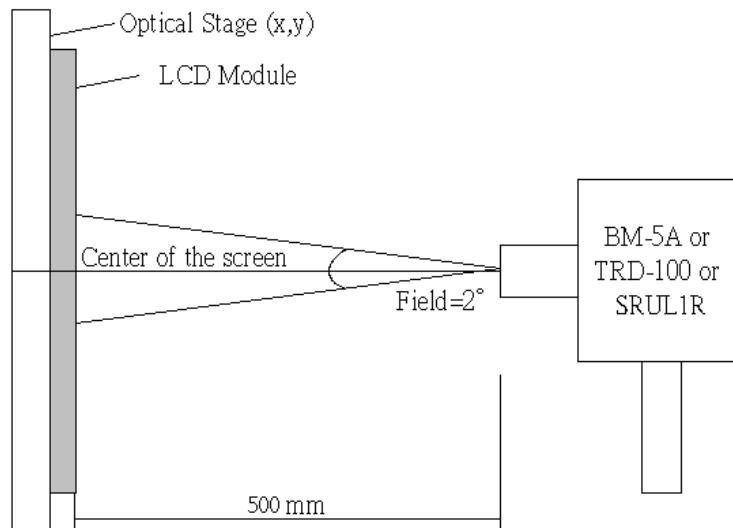
*3) Definition of Luminance and Luminance uniformity

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

5P Luminance (AVG): The white luminance is measured at measuring points 1~5 see Fig below.

9P Uniformity: Δ L = (Lmin / Lmax) ×100% at measuring points 1 & 6~13 see fig below.

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*4) Definition of view angle(θ ， ϕ)

Upper(+)

θ

ψ

Left(-)
Gate Drive Side

Right(+)

LCD Panel

Lower(-)

*5) Definition of response time
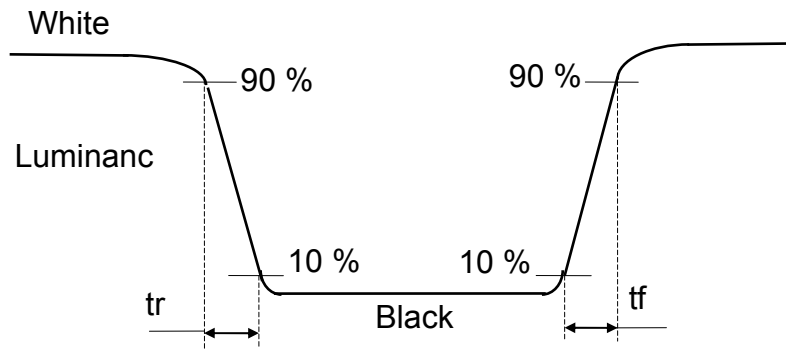
*6) Crosstalk Modulation Ratio:

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)
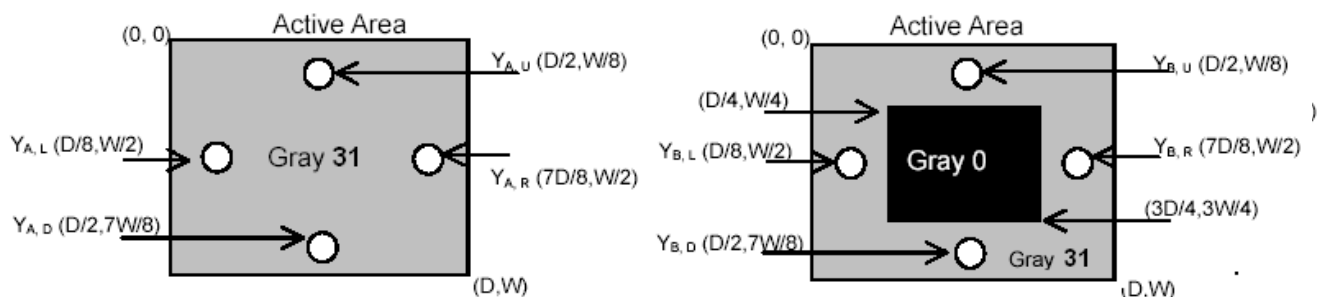
*7) Definition Gamma (VESA)

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).

$$y = \gamma x - k$$
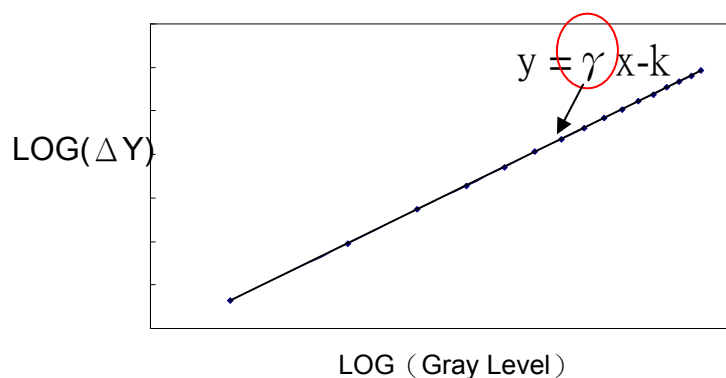
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9. RELIABILITY TEST CONDITIONS

(1) Temperature、Humidity and Pressure

TEST ITEMS	CONDITIONS
High Temperature Operation	60° C ；0%R.H；24Hrs
High Temperature High Humidity Operation	60° C ；90％ RH；96Hrs
Low Temperature Operation	-20° C ；0%R.H；24 Hrs
Thermal Shock	-30°C (0.5HR)～70°C (0.5HR), 30 cycle
Temperature and humidity cycle operation	-10℃~65℃ 、0%~93%R.H.；24hr/10 cycle
Cold Bubble	1.-20℃/24hr, 5 times dropping(height of 10cm) iron ball(5.4g, φ 11.0) 2.-20℃/48hr, 5 times dropping(height of 10cm) iron ball(5.4g, φ 11.0)

(2) Shock & Vibration

TEST ITEMS	CONDITIONS
Shock (Non-Operation)	Half-Sine, 200G, 2ms, ±XYZ, 1time
Vibration (Non-Operation)	Sine Wave 1.5G, 5~500Hz, XYZ 30min/each direction

(3) ESD

Power ON	Surface discharge (Panel display area、Frame)	
	Contact	Air
Capacity	150 pF	150 pF
Resistance	330 Ω	330 Ω
Voltage	±6kV	±8kV
Interval	1 sec	1 sec
Times(single point)	5	5

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

(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.