

Chunghwa Picture Tubes, Ltd.

Product Specification

To : SCL
Date : 2010/03/09

TFT LCD
CLAA133WB01A

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REVISION STATUS

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1. OVERVIEW

CLAA133WB01 is 13.3" color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, LVDS driver ICs, control circuit and LED backlight. By applying 6 bit digital data, 1366×RGB(3)×768, 262K colors are displayed on the 13.3" diagonal screen.

General specification are summarized in the following table:

ITEM	SPECIFICATION
Display Area	293.417(H)×164.966(V)(mm) (13.3-inch diagonal)
Number of Pixels	1366×3(H)×768(V)
Pixel Pitch	0.2148(H)×0.2148(V) (mm)
Color Pixel Arrangement	RGB island
Display Mode	Normally white
Number of Colors	262,144(6bits) (LVDS)
Gamut	42%(min)/45% (Typ)
Optimum Viewing Angle	6 o'clock
Response Time	8ms (Typ)
Surface Treatment	Anti Glare
Viewing Angle	40°、40°/15°、30° (Min)
Brightness	200 cd/m ² (5point) (Typ) 175 cd/m ² (5point) (Min)
Uniformity	5point : 80% 13point : 65%
Consumption of Power	(4.35) W (Max)
Module Size	306.8(W)×189.25(H)×3.6(D) (mm) (Max) 314.6(W)×189.25(H)×3.6(D) (Max) (with bracket)
Module Weight	290 g (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

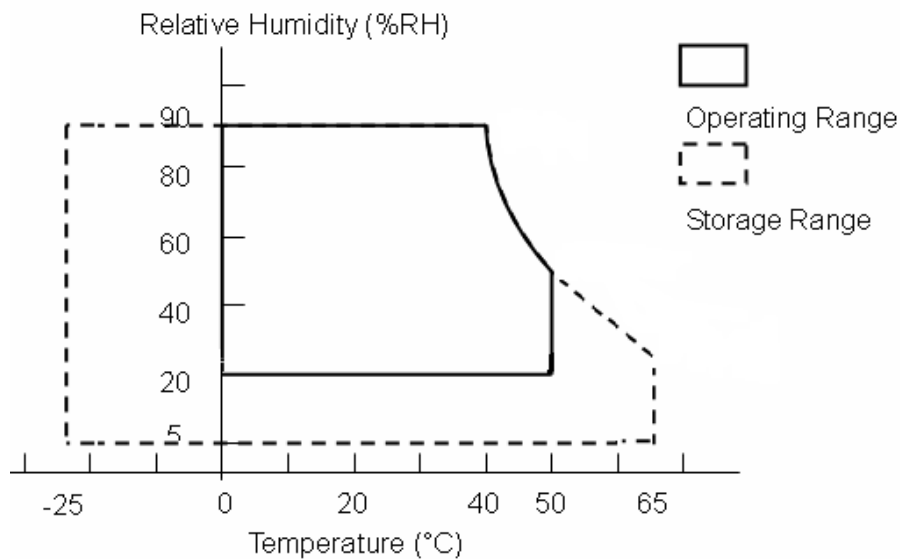
The following are maximum values, which if exceeded, may cause faulty operation or damage to the unit.

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ITEM	SYMBOL	MIN	MAX	UNIT	NOTE
LCD Power Voltage	VCC	0	4.0	V	
LED Driver Input Voltage	VBL+	(7)	(21)	V	
Operation Temperature	Top	0	50	°C	*1).*2).*3).*4)
Storage Temperature	Tstg	-25	65	°C	*1).*2).*3)

【Note】

- *1) Product life-time relate to LED current, please operate production follow statement at page 9 “(B)Backlight”.
- *2) When LED current over the definition of absolute max, product life-time will decay rapidly or operate unusual.
- *3) The relative temperature and humidity range are as below sketch, 90%RH Max. ($T_a \leq 40^\circ\text{C}$)
- *4) The maximum wet bulb temperature $\leq 39^\circ\text{C}$ ($T_a > 40^\circ\text{C}$) and without dewing.
- *5) 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.
- *6) If you operate LCD in normal temperature range, the center surface of panel should be under 50°C .
- *7) The suggested external PWM frequency's typical value is 200Hz.
- *8) Maximum LED Driver Input Current at 7V Input Voltage.



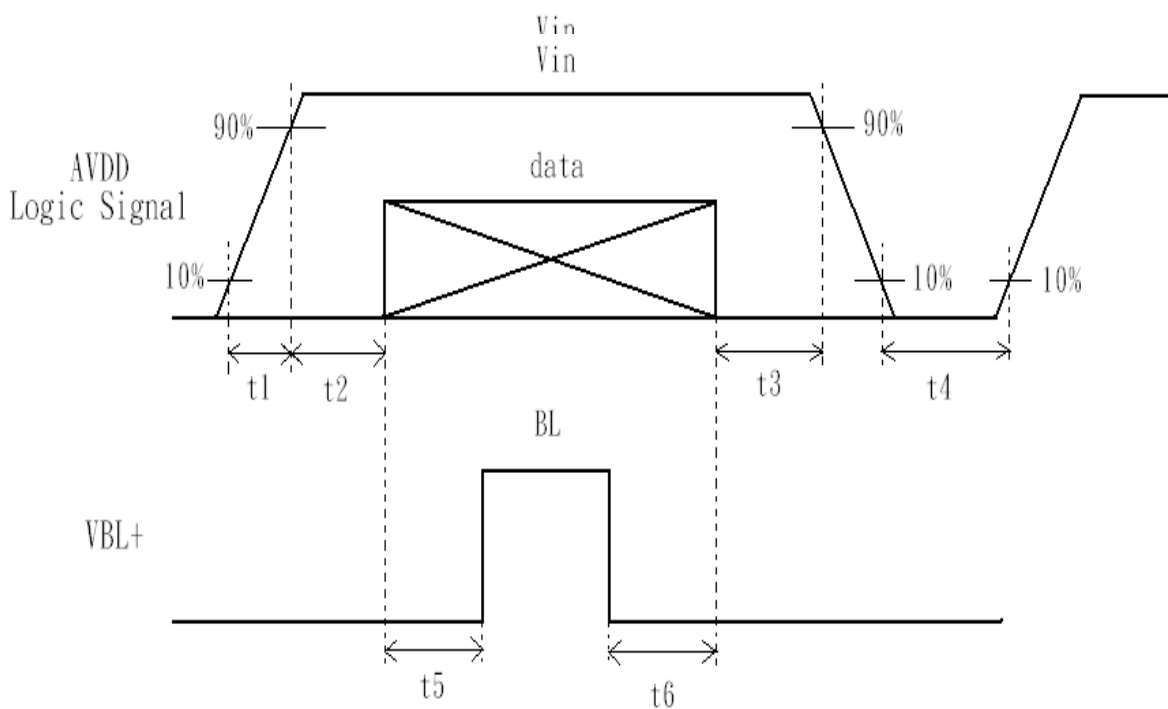
3. ELECTRICAL CHARACTERISTICS

(A) (A)TFT LCD Power Voltage

ITEM		SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Power Voltage		VCC	3.0	3.3	3.6	V	*1)
LCD Power Current		ICC	-	(285)	(370)	mA	*2)
Rush Current		Irush	-	-	2	A	*4)
Logic Input Voltage (LVDS: IN+,IN-)	Common Voltage	VCM	1.125	1.25	1.375	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 :

$0.5\text{ ms} \leq t1 \leq 10\text{ms}$	$500\text{ms} \leq t4$
$0.01\text{ ms} < t2 \leq 50\text{ ms}$	$200\text{ ms} \leq t5$
$0.01\text{ ms} < t3 \leq 50\text{ ms}$	$200\text{ ms} \leq t6$

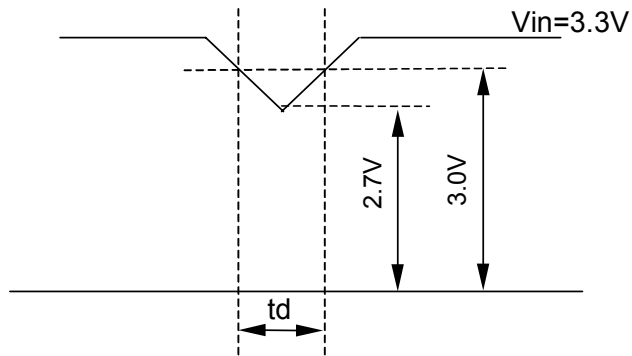


data:RGB DATA, DCLK, HD, VD, DENA

VCC-dip state

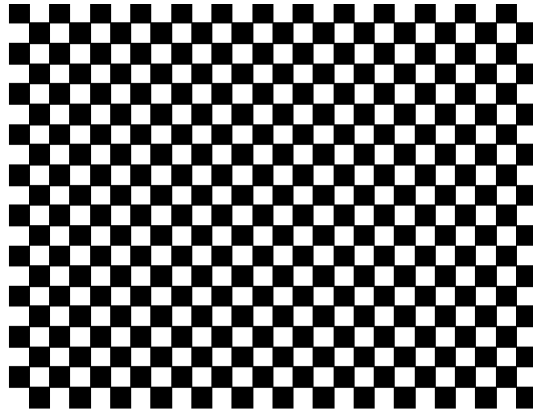
(1)when $3.0 > VCC \geq 2.7V$ & $t_d \leq 10$ ms module works well.

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



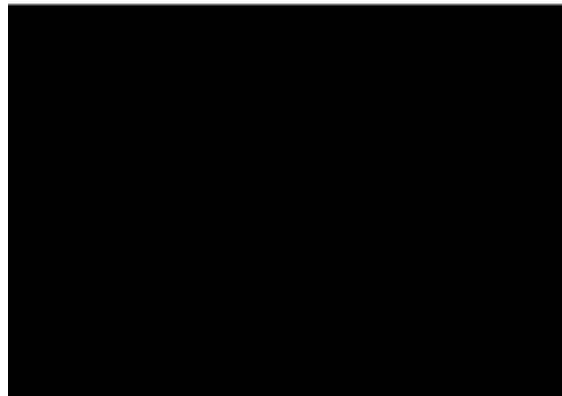
【Note 2】 Typical value is Mosaic (32*36 Checker board) Pattern : 768 line mode ◦

Circuit condition (typ) : $VCC=3.3$ V , $fV=60$ Hz $fH=48.36$ kHz , $fCLK=75.44$ MHz

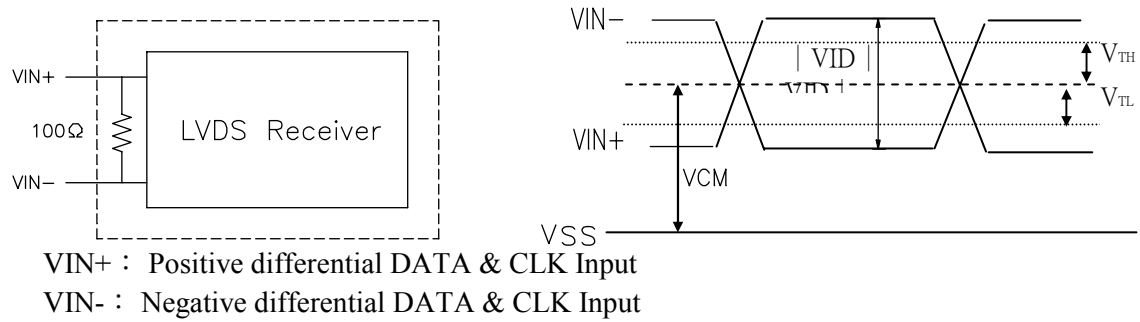


Max value is Black Pattern : 768 line mode ◦

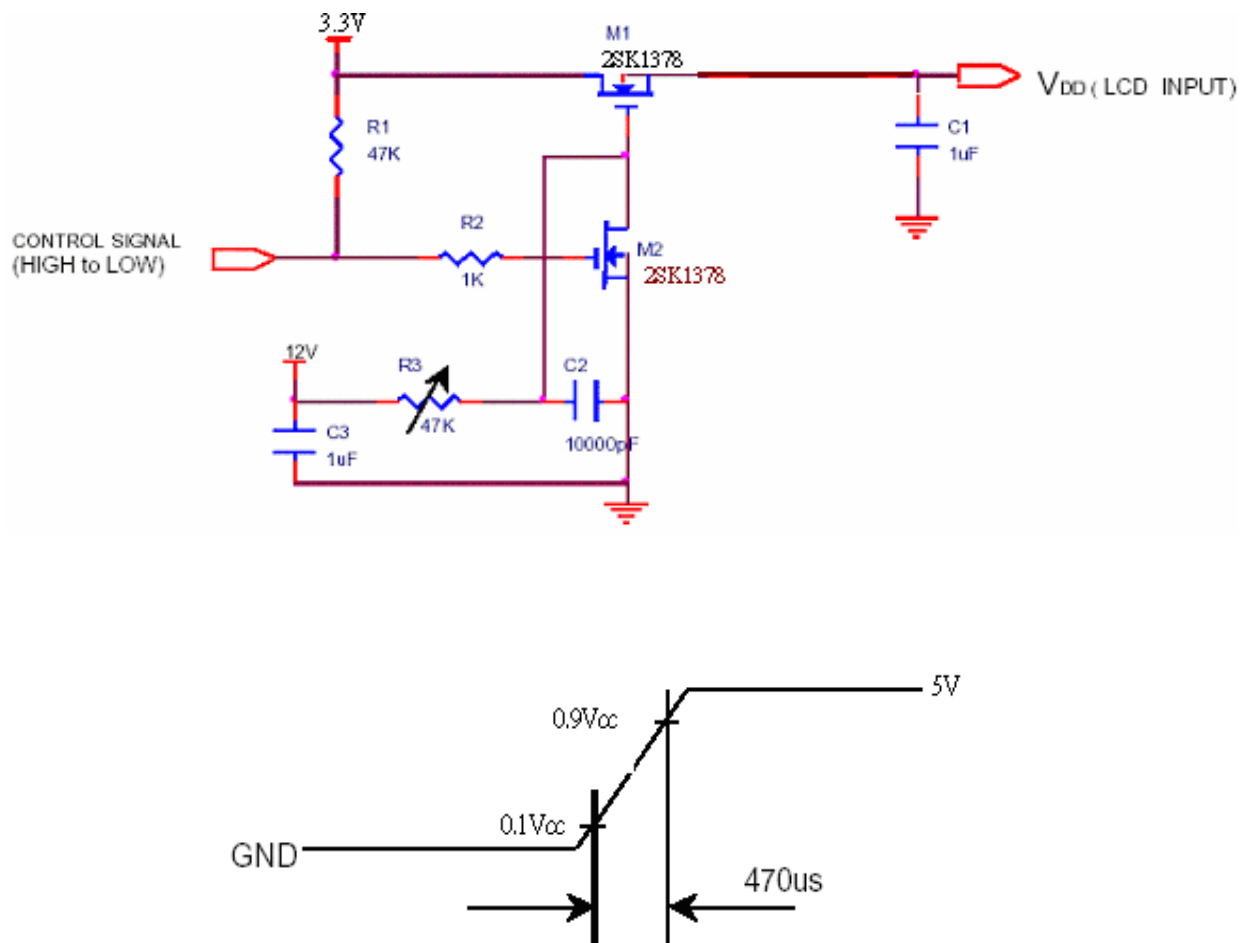
Circuit condition (max) : $VCC=3.3$ V , $fV=60$ Hz $fH=48.36$ kHz , $fCLK=75.44$ MHz



【Note 3】 LVDS Signal Definite :



【Note 4】 Irush measure condition



(B) BACKLIGHT

(a.) Electrical Characteristics ELECTRICAL CHARACTERISTICS

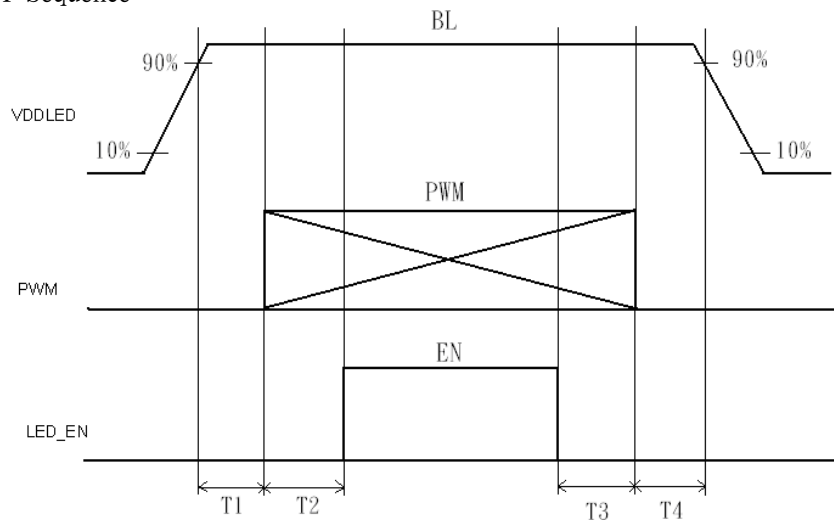
Ta=25°C

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LED Driver Input Voltage	VBL+	7	12	21	V	
LED Driver Input Current	IBL+	-	(262)	(485)	mA	*1)
Forward Voltage	V _F	2.9	3.2	3.5	V	*2) I _F =19mA
Forward Current	I _F	18.5	19	19.5	mA	*2) I _F =19mA
Power Consumption	PLED	(2.6)	(2.87)	(3.1)	W	*2)*3) I _F =19mA
PWM Frequency	PWM_BL	180	200	1000	Hz	
Duty ratio	Dim	10	-	100	%	

(b.) LED LIFE – TIME

ITEM	CONDITION	MIN	TYP	MAX	UNIT	NOTE
Life Time	I _F =20mA、Ta=25°C	15000			hrs	*4)

(c.) LED ON/OFF Sequence :



$$10\text{ms} \leq T1 \quad 0\text{ms} \leq T3$$

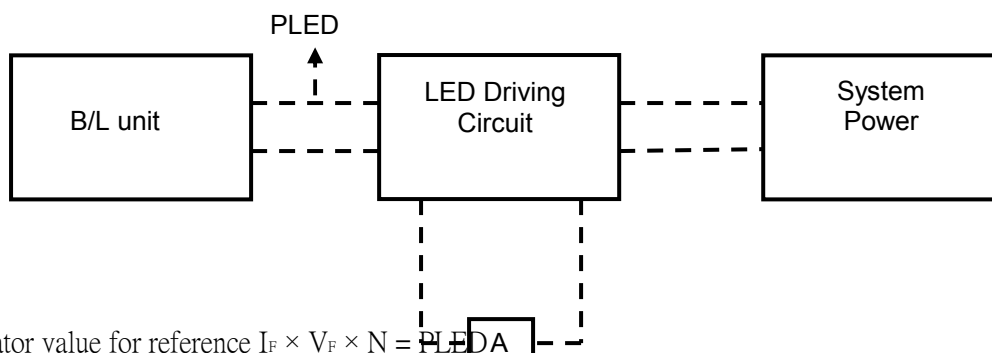
$$10\text{ms} \leq T2 \quad 10\text{ms} \leq T4$$

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

*1) Maximum LED Driver Input Current at 7V 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 $I_F \times V_F \times N = \text{PLEDA}$

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

4. CONNECTOR INTERFACE PIN & FUNCTION

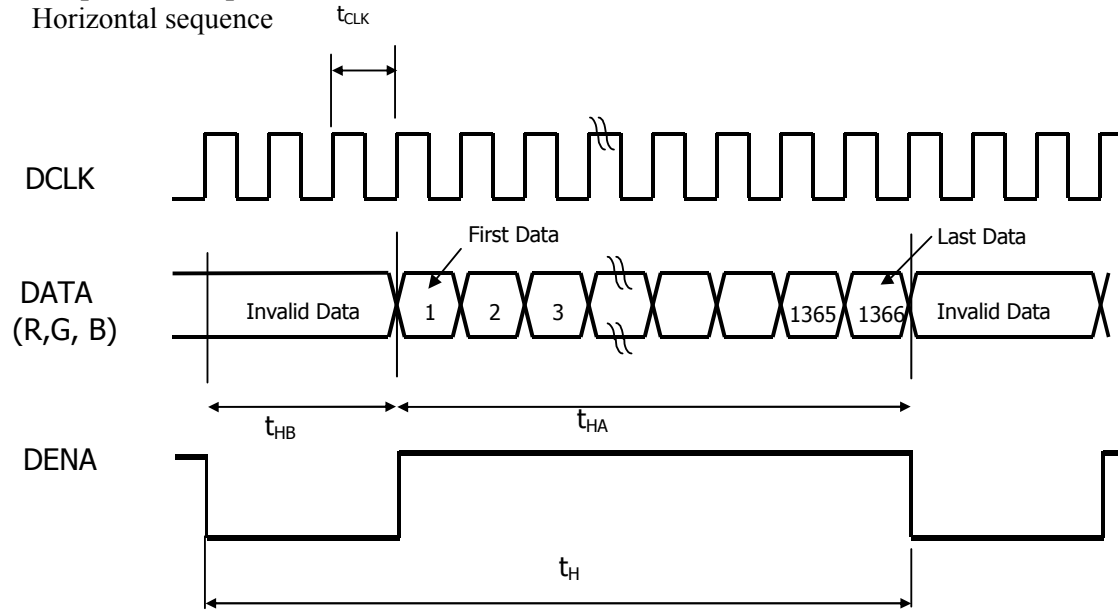
CN (Interface signal)

Outlet connector: I-PEX 20455-040E-12

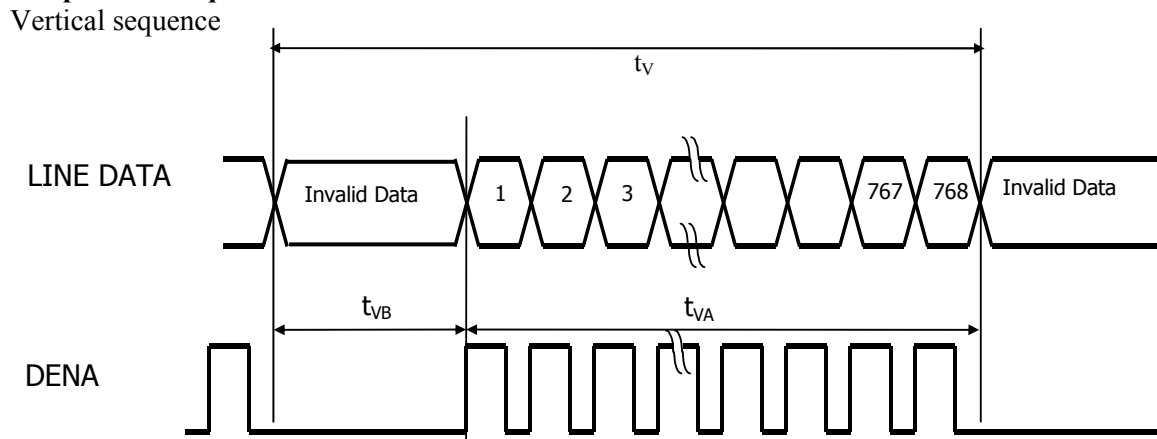
Pin No.	SYMBOL	FUNCTION
1	NC	No connection(Please let it floating for CPT test only)
2	VDD	Power Supply, 3.3 V (typical)
3	VDD	Power Supply, 3.3 V (typical)
4	V EEDID	DDC 3.3V power
5	NC	No Connect
6	Clk EEDID	DDC Clock
7	DATA EEDID	DDC Data
8	Odd_Rin0-	- LVDS differential data input (R0-R5, G0) (odd pixels)
9	Odd_Rin0+	+ LVDS differential data input (R0-R5, G0) (odd pixels)
10	VSS	Ground – Shield
11	Odd_Rin1-	- LVDS differential data input (G1-G5, B0-B1) (odd pixels)
12	Odd_Rin1+	+ LVDS differential data input (G1-G5, B0-B1) (odd pixels)
13	VSS	Ground – Shield
14	Odd_Rin2-	- LVDS differential data input (B2-B5, HS, VS, DE) (odd pixels)
15	Odd_Rin2+	+ LVDS differential data input (B2-B5, HS, VS, DE) (odd pixels)
16	VSS	Ground – Shield
17	Odd_ClkIN-	- LVDS differential clock input (odd pixels)
18	Odd_ClkIN+	+ LVDS differential clock input (odd pixels)
19	NC	No connection(Please let it floating for CPT test only)
20	NC	No connection(Please let it floating for CPT test only)
21	NC	No connection(Please let it floating for CPT test only)
22	VSS	Ground – Shield
23	NC	No connection(Please let it floating for CPT test only)
24	NC	No connection(Please let it floating for CPT test only)
25	VSS	Ground – Shield
26	NC	No connection(Please let it floating for CPT test only)
27	NC	No connection(Please let it floating for CPT test only)
28	VSS	Ground – Shield
29	NC	No connection(Please let it floating for CPT test only)
30	NC	No connection(Please let it floating for CPT test only)
31	VSSLED	Ground – LED
32	VSSLED	Ground – LED
33	VSSLED	Ground – LED
34	NC	No connection(Please let it floating for CPT test only)
35	PWM	System PWM Signal Input (+3.3V Swing)
36	LED_EN	LED enable pin (+3.3V Input)
37	NC	No connection(Please let it floating for CPT test only)
38	VDDLED	7V – 21V LED power
39	VDDLED	7V – 21V LED power
40	VDDLED	7V – 21V LED power

5. INTERFACE TIMING CHART

(A) LVDS input time sequence



(B) LCD input time sequence



(C) Timing Chart

ITEM				SYMBOL	MIN	TYP	MAX	UNIT
LCD Timing	Frame Rate			-	(55)	60	(65)	Hz
	DCLK		Frequency	f _{CLK}	(65.93)	75.44	(88.74)	MHz
			Period	t _{CLK}	(15.17)	13.25	(11.27)	ns
	DENA	Horizontal	Horizontal Total time	t _H	(1498)	1560	(1665)	t _{CLK}
			Horizontal Active time	t _{HA}	1366	1366	1366	t _{CLK}
			Horizontal Blank time	t _{HB}	(132)	194	(299)	t _{CLK}
		Vertical	Vertical Total time	t _V	(800)	806	(820)	t _H
			Vertical Active time	t _{VA}	768	768	768	t _H
			Vertical Blank time	t _{VB}	(32)	38	(52)	t _H
LVDS Spread Spectrum Range *3)				-2		2	%	

【Note】

- *1) DENA (DATA ENABLE) usually is positive.
- *2) During the whole blank period, DCLK should keep input.
- *3) At 100kHz modulation rate (LVDS=90MHz).

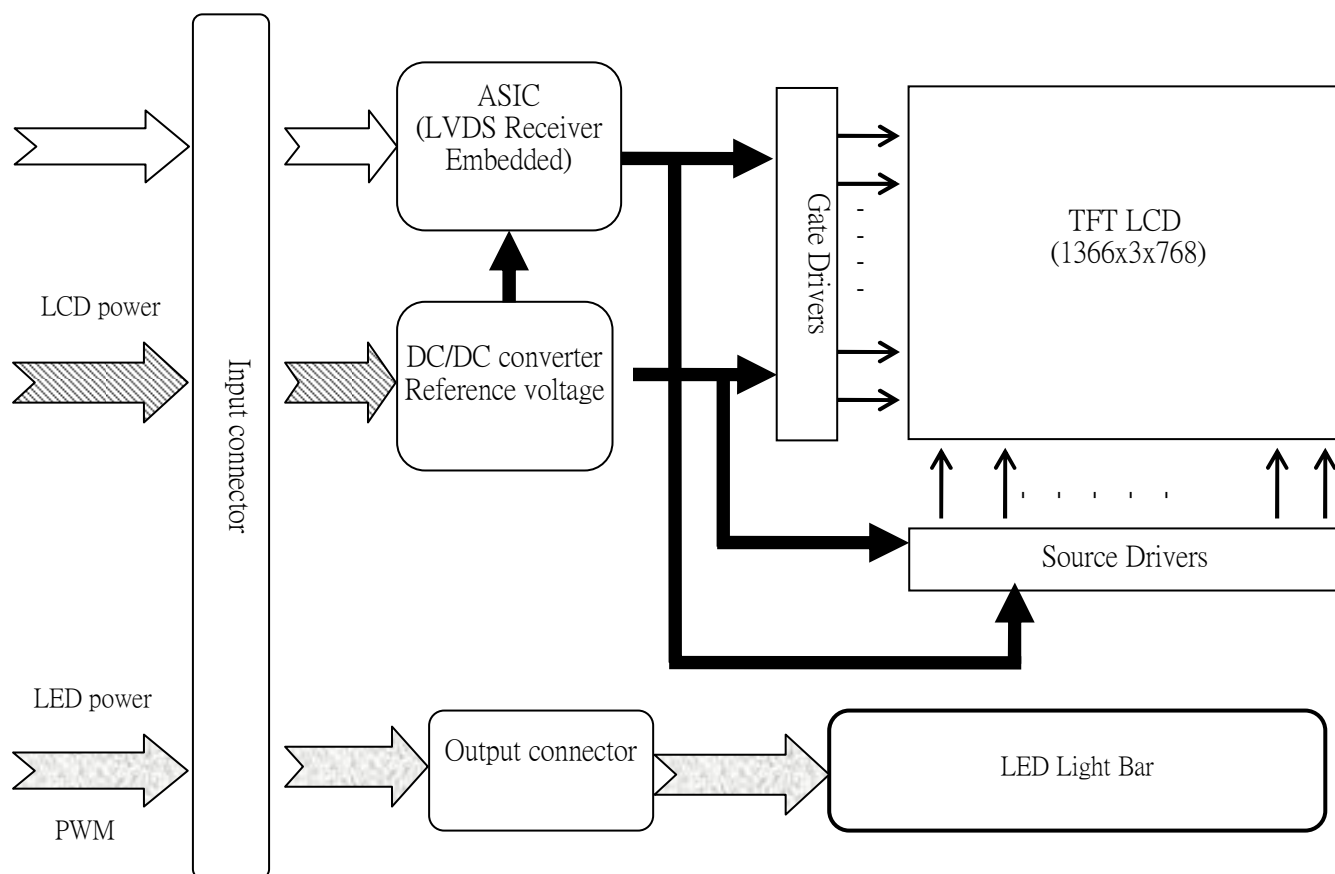
(D) DATA mapping

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
		MS B					LS B	MS B					LS B	MS B					LS B
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

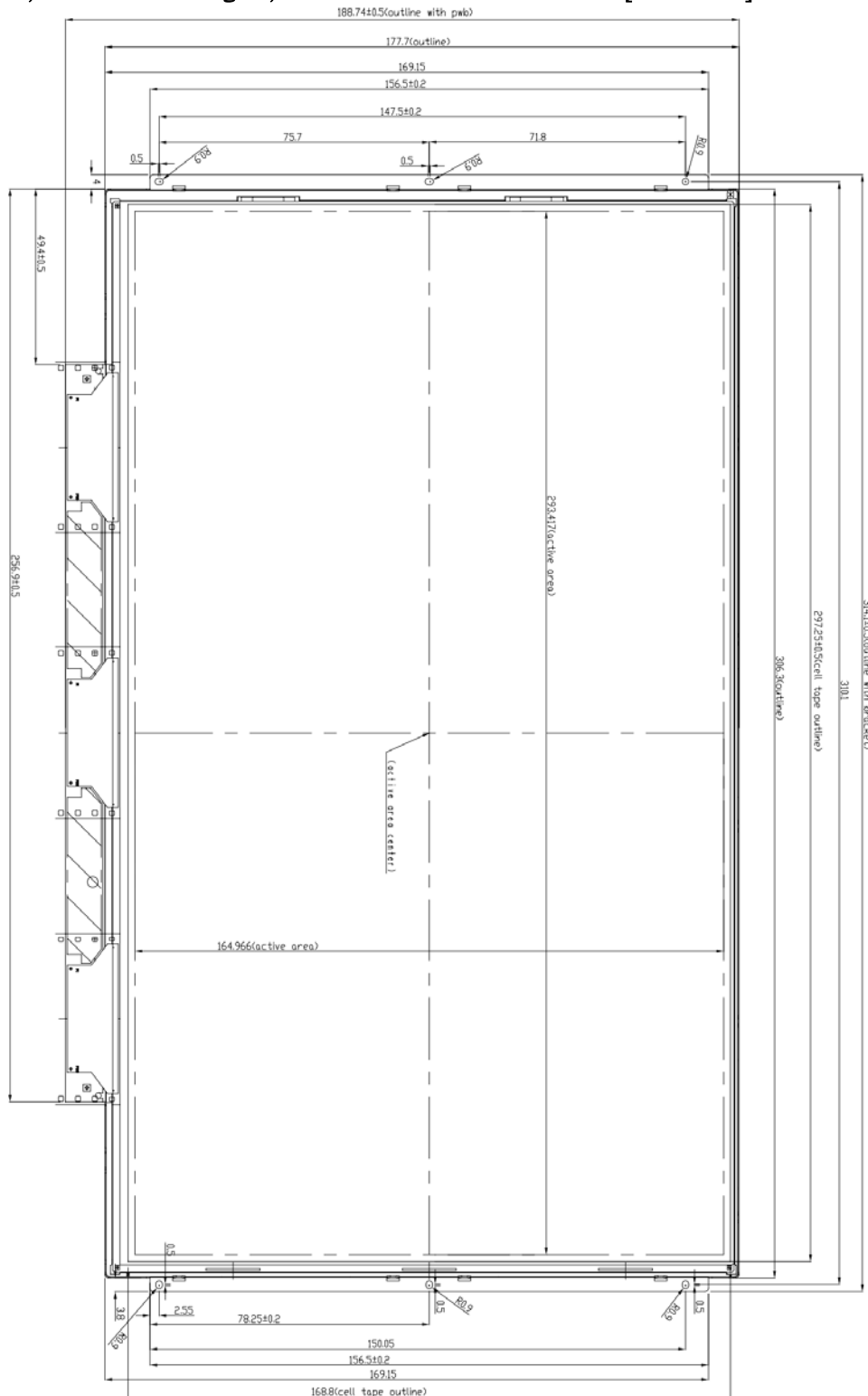


7. MECHANICAL SPECIFICATION

(1) Front side

The tolerance, not show in the figure, is ± 0.5 mm.

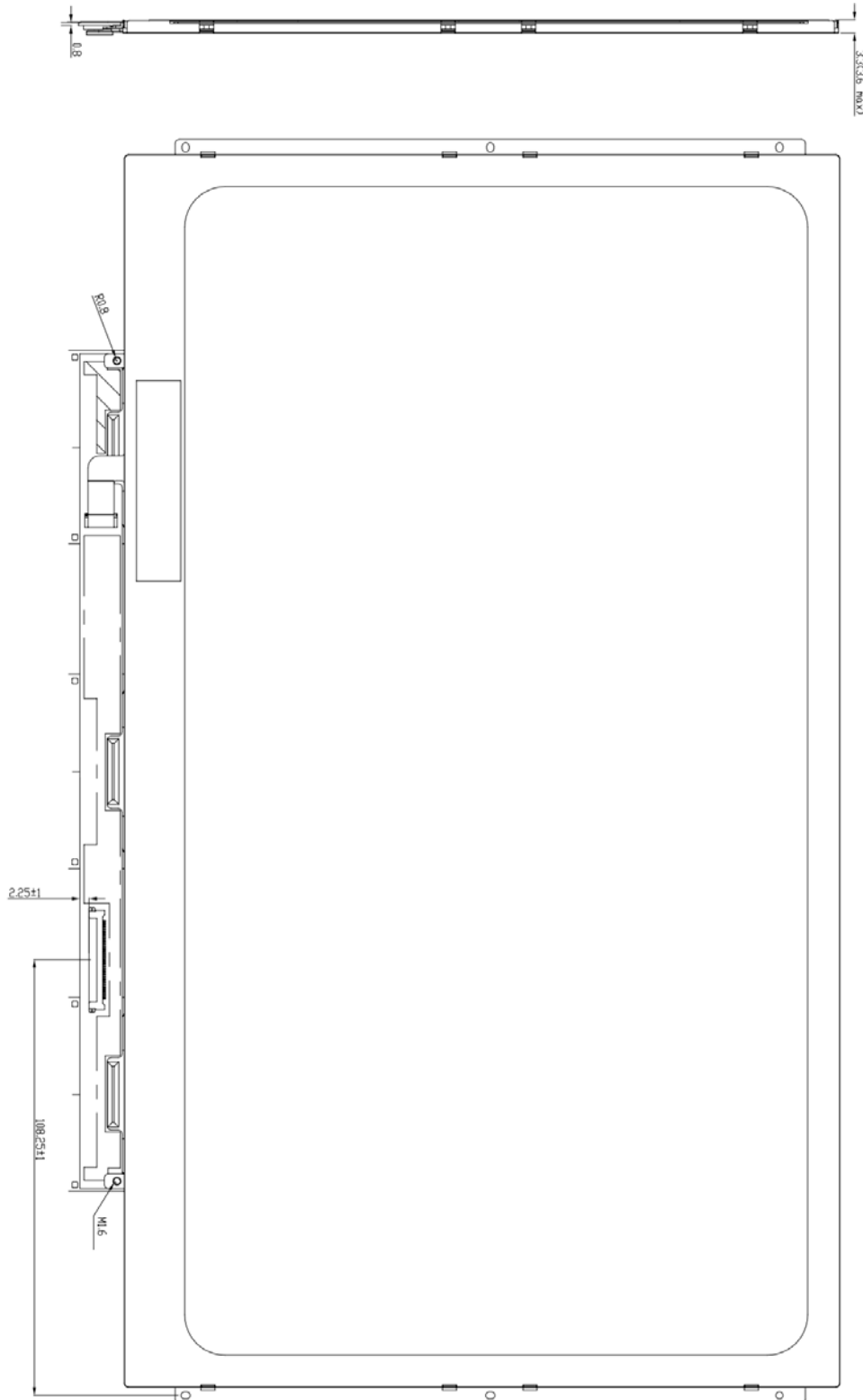
[Unit : mm]



(2) Rear side

The tolerance, not show in the figure, is ± 0.5 mm.

[Unit : mm]



8. OPTICAL CHARACTERISTICS

Ta=25°C , VDD=3.3V

ITEM		SYMBOL	CONDITION	MIN	TYP	MAX	UNIT	NOTE
Contrast Ratio		CR	$\theta = \psi = 0^\circ$	(500)	(600)		--	*1) 2)
Luminance (5P)		L	$\theta = \psi = 0^\circ$	175	200		cd/m ²	*1) 3)
Uniformity(5P)		ΔL	$\theta = \psi = 0^\circ$	80			%	*1) 3)
Response Time	Tr		$\theta = \psi = 0^\circ$		8	16	ms	*5)
	Tf		$\theta = \psi = 0^\circ$				ms	*5)
Cross Talk		CT	$\theta = \psi = 0^\circ$			1	%	*6)
View Angle	Horizontal	ψ	$CR \geq 10$	40/-40			°	*4)
	Vertical	θ		15/-30			°	*4)
Color Coordinate	W	x	$\theta = \psi = 0^\circ$	(0.293)	(0.313)	(0.333)	Color Coordinates	*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)		
Gamut			$\theta = \psi = 0^\circ$	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=19mA (each LED)

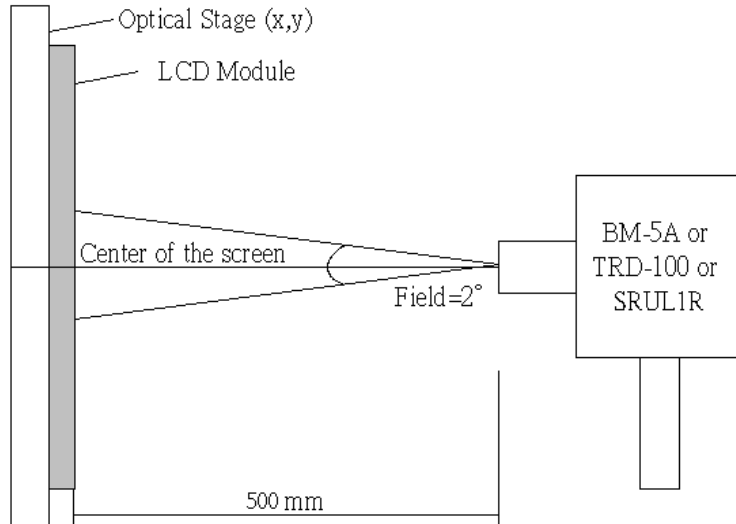
Definition of these measurement items is as follows:

***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: $\Delta L = (L_{min} / L_{max}) \times 100\%$

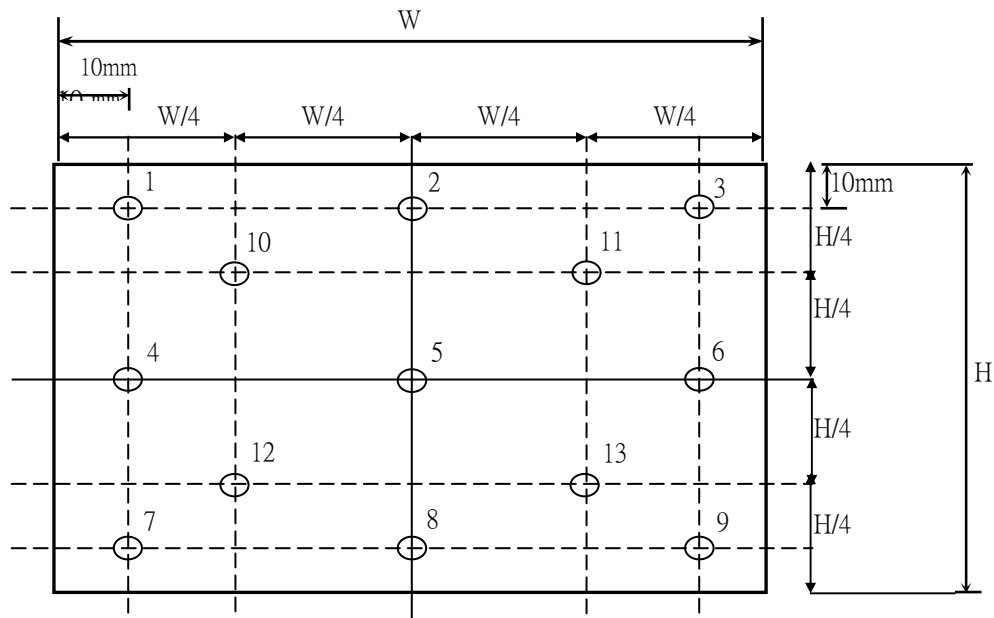
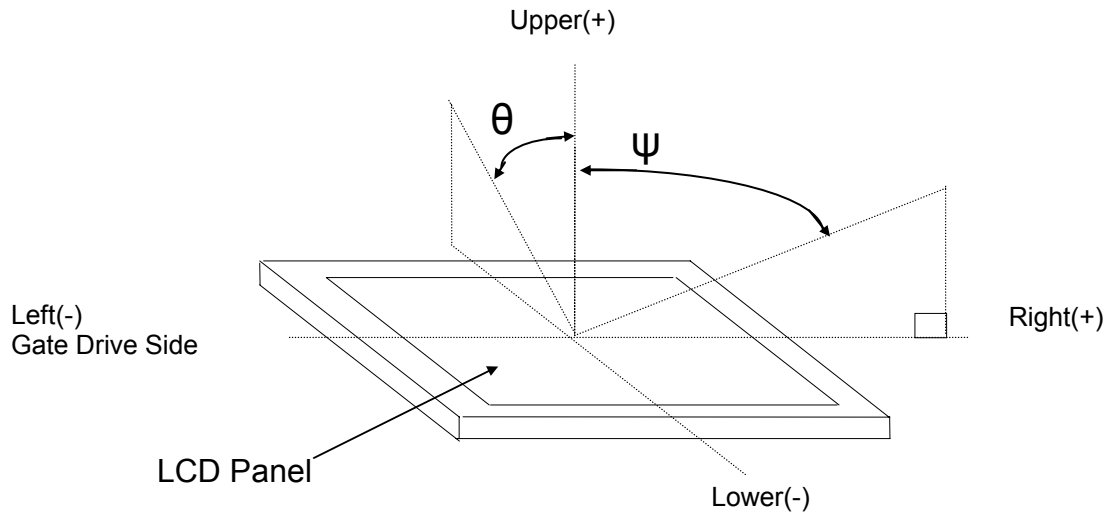
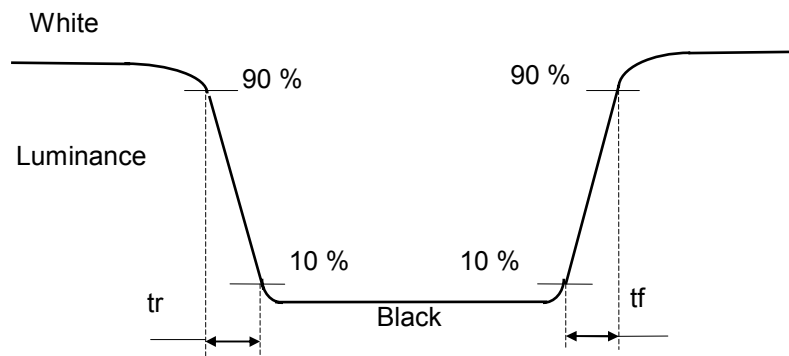


Fig.1 Measure point (Active area)

***4) Definition of view angle(θ , ψ)**



***5) Definition of response time**



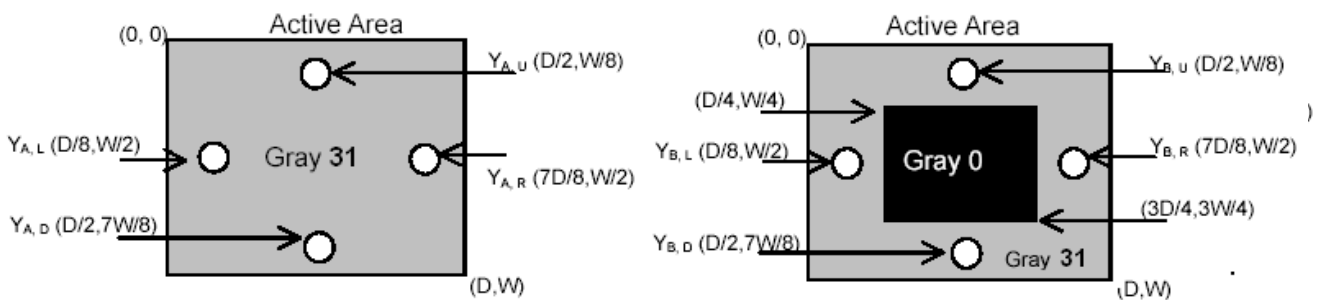
***6) Crosstalk Modulation Ratio:**

$$CT = |Y_B - Y_A| / Y_A \times 100\%$$

Y_A 、 Y_B measure position and definition

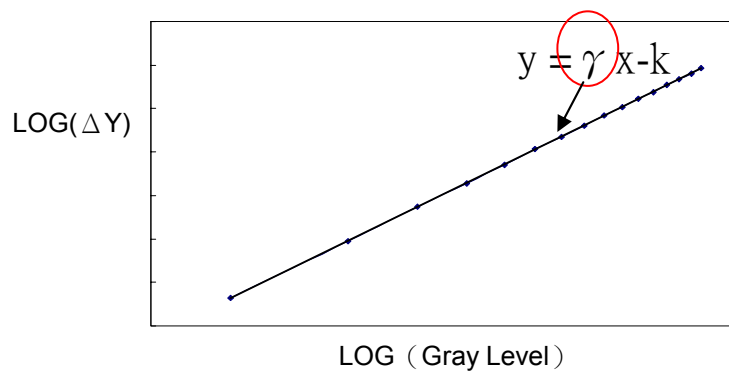
Y_A means luminance at gray level 32(exclude gray level 0 pattern)

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

(A) Temperature 、 Humidity and Pressure

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 ; 95% RH ; 48 Hrs
Low Temperature Operation	0° C ; 250 Hrs
Low Temperature Storage	-25° C ; 250 Hrs
Thermal Shock	-40° C (30 Mins) ~ 65° C (30 Mins) , 100 CYCLE
Low Temperature Low Pressure Storage	0° C 、 260hPa 、 24 Hrs

(B) Shock & Vibration

TEST ITEMS	CONDITIONS
Shock (Non-Operation)	Shock level : 2058m/s ² (210G), Waveform : half sinusoidal wave, 2ms, 6 axis (± X, ± Y, ± Z) per cycle
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.

(C) ESD

	Surface discharge (Panel display area 、 Frame)		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

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

(E) 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.