



Chunghwa Picture Tubes, Ltd.

Technical Specification

To
Data 2013/07/06

CPT TFT-LCD
CLAA101WJ02

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1. OVERVIEW

CLAA101WJ02 is 10.1” color TFT-LCD (Thin Film Transistor Liquid Crystal Display) module composed of LCD panel, LVDS driver ICs, control circuit and backlight. By applying 8 bit digital data, 1366×RGB (3) ×768, 16.7M-color images are displayed on the 10.1” diagonal screen. general specifications are summarized in the following table :

ITEM	SPECIFICATION
Display Area	223.341 (H)x125.568 (V) (mm)
Number of Pixels	1366 ×RGB(H)×768 (V)
Pixel Pitch	163.5(H) x 163.5(V) um
Color Pixel Arrangement	RGB vertical stripe
Display Mode	Normally Black
Number of Colors	16.7M
Gamut	50%(Typ)
Optimum Viewing Angle	--
Response Time	30ms (Typ)/50ms (Max)
Surface Treatment	HC
Viewing Angle	80°、80° / 80°、80°(Min) 85°、85° / 85°、85°(Typ.)
Brightness	Typ 400nit
Uniformity	5point 80% min 13point 70% min
Power Consumption (Max)	2.69W *1)
Module Size	234.53 x138.97(V)x 2.4 (W/o)(Typ) 234.53 x138.97(V)x 4.2 (W/P)(Typ)
Module Weight	115g (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.

【Note】

*1) Power Consumption is with 85% efficient of LED driver.

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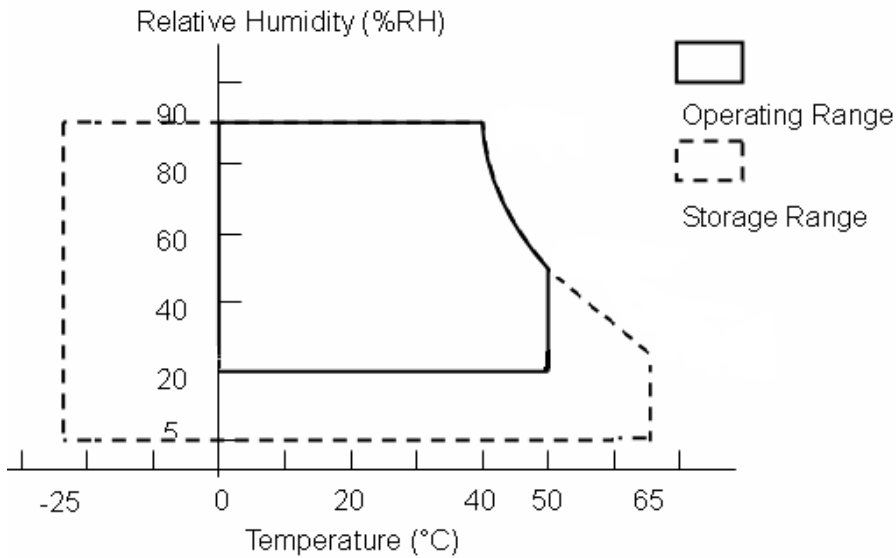
2. ABSOLUTE MAXIMUM RATINGS

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	VCC	0	3.6	V	
Operation Temperature	Top	0	50	°C	*1). 2). 3). 4)
Storage Temperature	Tstg	-20	60	°C	*1). 2). 3)

【Note】

- *1) The relative temperature and humidity range are as below sketch, 90%RH Max. ($T_a \leq 40^\circ\text{C}$)
- *2) The maximum wet bulb temperature $\leq 39^\circ\text{C}$ ($T_a > 40^\circ\text{C}$) 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°C .



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3. ELECTRICAL CHARACTERISTICS

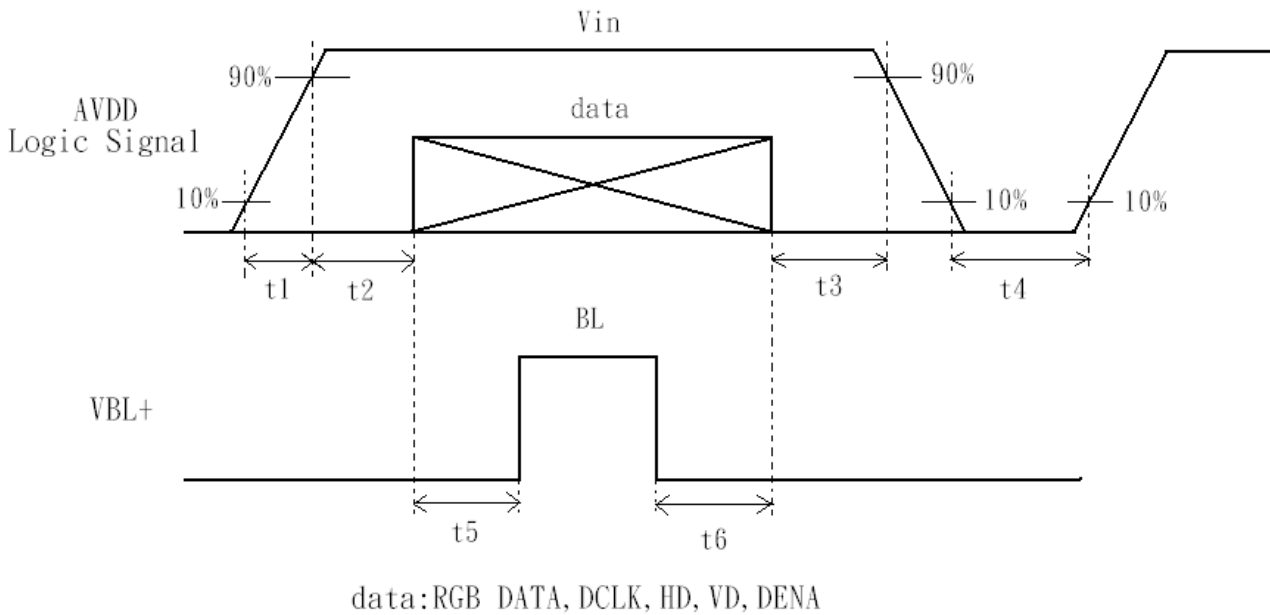
(A) TFT LCD

TEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Power Voltage	VCC	3.0	3.3	3.6	V	*1)
LCD Power Current	ICC	-	-	233	mA	*2)
LCD Power	PDD	-	-	0.7	W	*2)
Rush Current	Irush	-	-	2	A	*3)

【Note】

*1) Power Sequence :

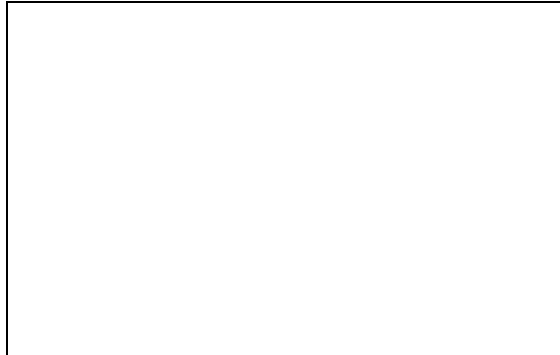
- | | |
|---|--------------------------|
| $0.5 \text{ ms} \leq t1 \leq 10\text{ms}$ | $500 \text{ ms} \leq t4$ |
| $0.01 \text{ ms} < t2 \leq 50 \text{ ms}$ | $200 \text{ ms} \leq t5$ |
| $0.01 \text{ ms} < t3 \leq 50 \text{ ms}$ | $200 \text{ ms} \leq t6$ |



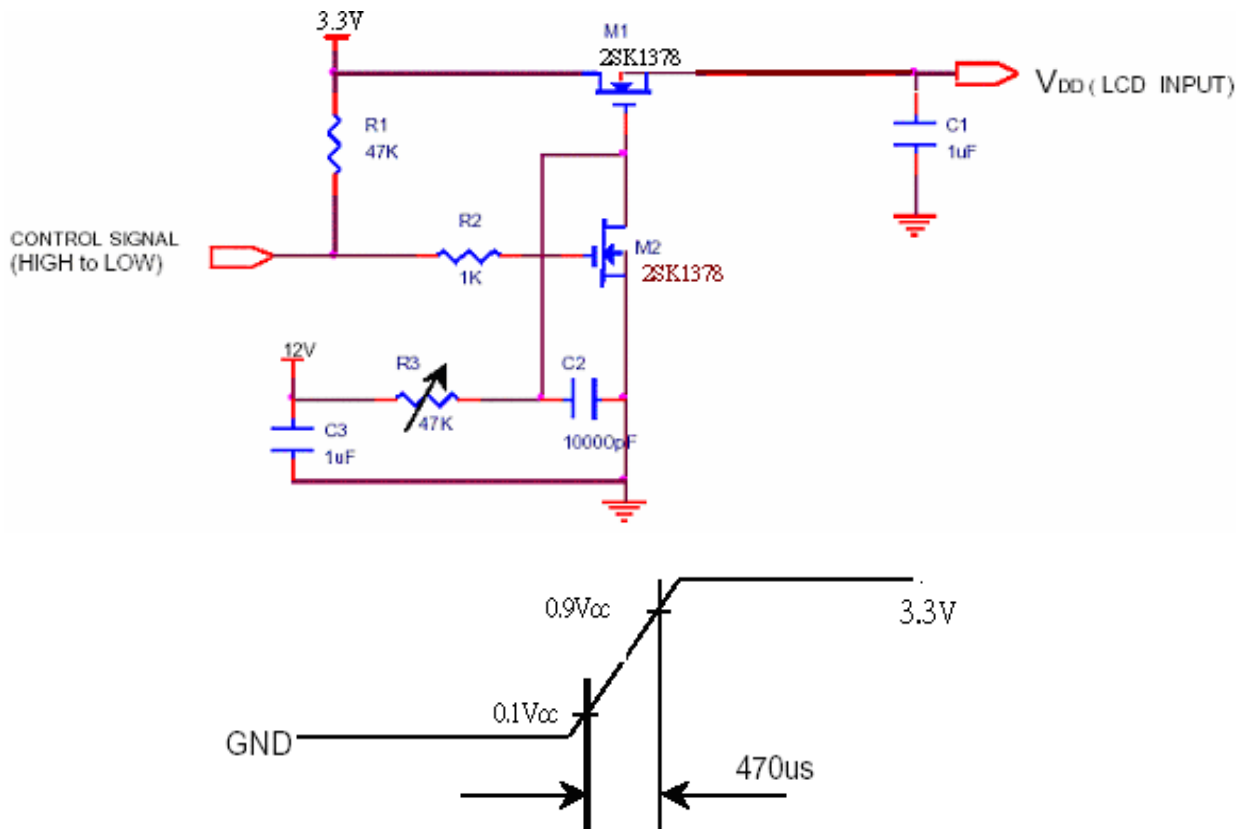
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*2) Max value is White Pattern :

Circuit condition (Max.) : $V_{CC}=3\text{ V}$, $f_V=60.06\text{ Hz}$, $f_H=48\text{ kHz}$, $f_{CLK}=75.4\text{ MHz}$



*3) Irush measure condition



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(B) BACK LIGHT

(a.) ELECTRICAL CHARACTERISTICS

Ta=25°C

ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LED Driver Input Voltage	VBL+	16.8	17.4	18.0	V	
LED Driver Input Current	IBL+		99		mA	
Forward Voltage	VF	2.8	2.9	3.0	V	
Forward Current	IF	-	15.67	-	mA	
Power consumption	PLED	-	1.92	1.99	W	*1)
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	Ir=20mA、Ta=25°C	10000			hrs	*2)

*1) Every LED string consist of 6 pcs LED

Calculated value for reference (VLED × ILED × # of LEDs (36EA)).

This value is with LED driver efficiency (85%)

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

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4. Connector Interface PIN & Function

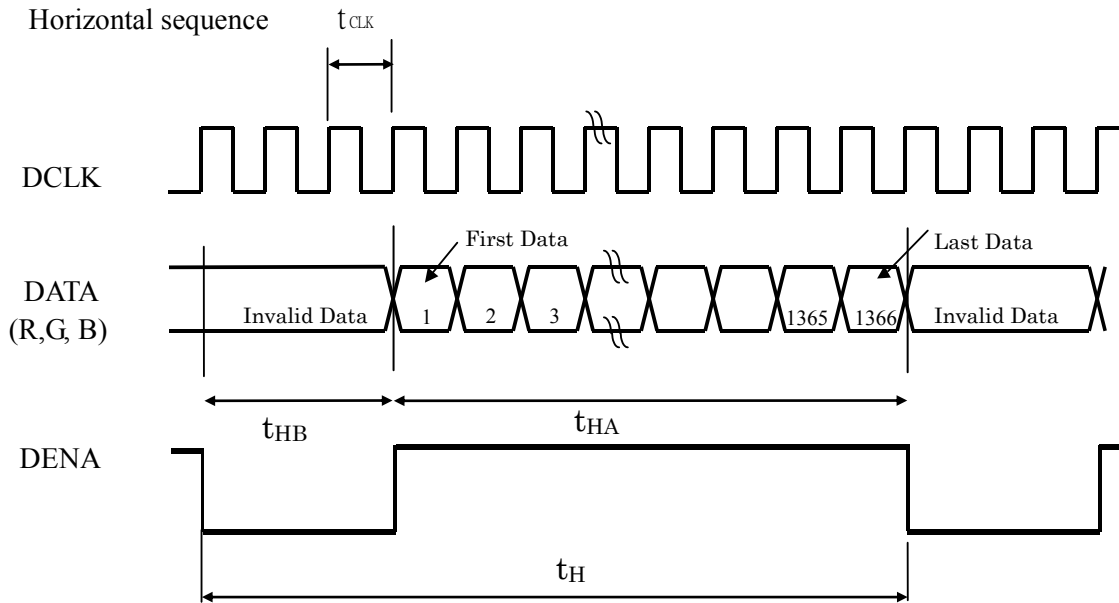
connector: 20455-040E-12or equivalent

Pin No.	SYMBOL	FUNCTION
1	NC	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 RxIn0-	-LVDS Differential Data Input
9	Odd RxIn0+	+LVDS Differential Data Input
10	GND	Ground
11	Odd RxIn1-	-LVDS Differential Data Input
12	Odd RxIn1+	+LVDS Differential Data Input
13	GND	Ground
14	Odd RxIn2-	-LVDS Differential Data Input
15	Odd RxIn2+	+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	Odd RxIn3-	-LVDS Differential Data Input
21	Odd RxIn3+	+LVDS Differential Data Input
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 12V(typical)
39	VBL	LED Backlight Power 12V(typical)
40	VBL	LED Backlight Power 12V(typical)

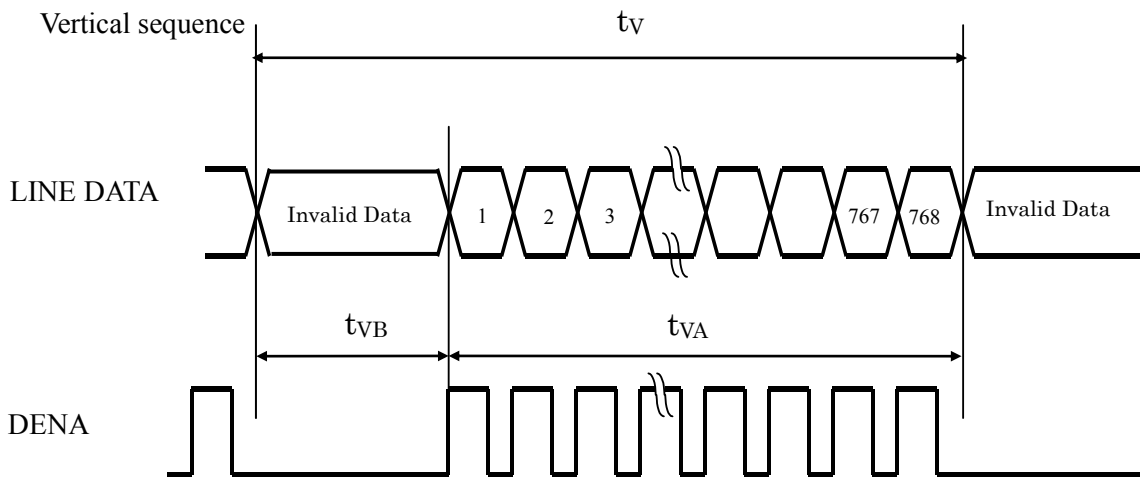
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5. INTERFACE TIMING CHART

(1)(a) LVDS input time sequence



(b) LCD input time sequence



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(2) Timing Chart

ITEM			SYMBOL	MIN	TYP	MAX	UNIT	
LCD Timing	Frame Rate		-	-	60	-	Hz	
	DCLK		Frequency	f_{CLK}	-	75.44	-	MHz
	DENA	Horizontal	Horizontal total time	t_H	-	1570	-	t_{CLK}
			Horizontal Active time	t_{HA}	-	1366	-	t_{CLK}
			Horizontal Blank time	t_{HB}	-	204	-	t_{CLK}
	Vertical	Vertical	Vertical total time	t_V	-	838	-	t_H
			Vertical Active time	t_{VA}	-	768	-	t_H
Vertical Blank time			t_{VB}	-	32	-	t_H	

【Note】

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

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(3) DATA mapping

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7 MSB	R6	R5	R4	R3	R2	R1	R0 LSB	G7 MSB	G6	G5	G4	G3	G2	G1	G0 LSB	B7 MSB	B6	B5	B4	B3	B2	B1	B0 LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	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	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	0	0	0	0	0	
	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	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	0	0	0	0	0	
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	
	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	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	0	0	0	0	0	
	BLUE(1)	0	0	0	0	0	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	0	0	0	0	0	1	0	
	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	

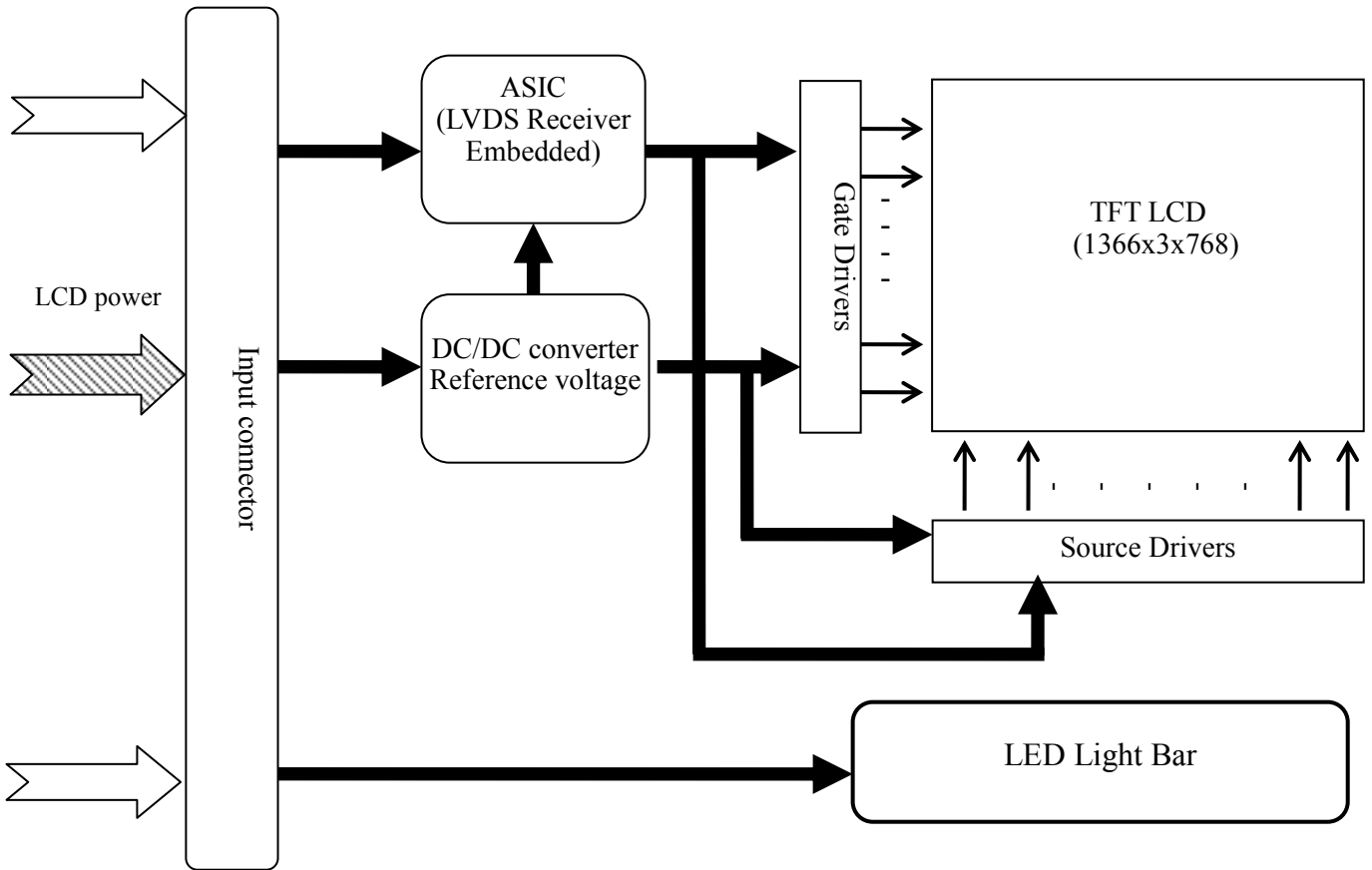
【Note】

- 1) Gray level:
Color(n) : n is level order; higher n means brighter level.
- 2) DATA:
1: high , 0: low

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6. BLOCK DIAGRAM



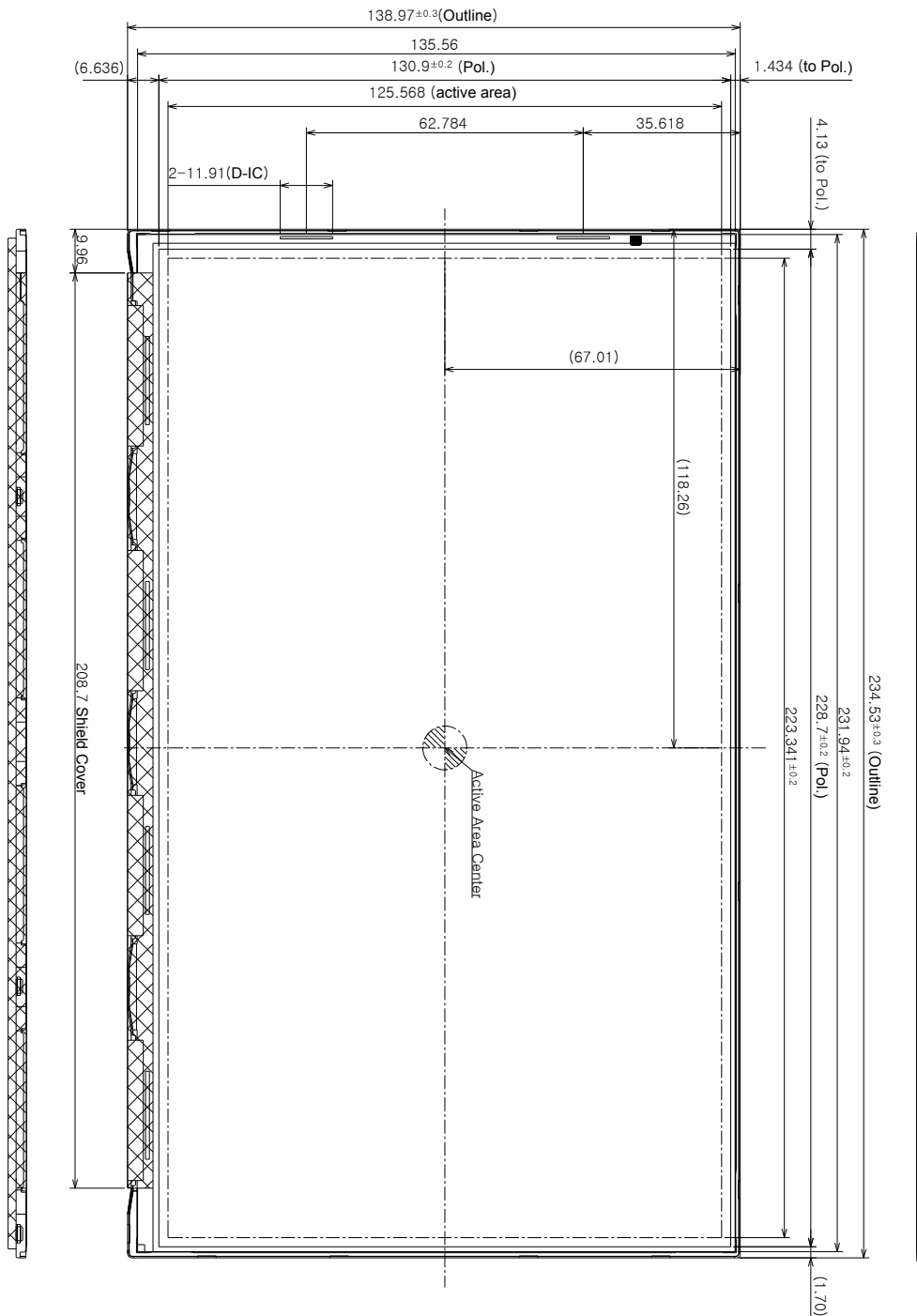
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7. MECHANICAL SPECIFICATION

(1) Front side

The tolerance, not show in the figure, is $\pm 0.2\text{mm}$.

[Unit : mm]

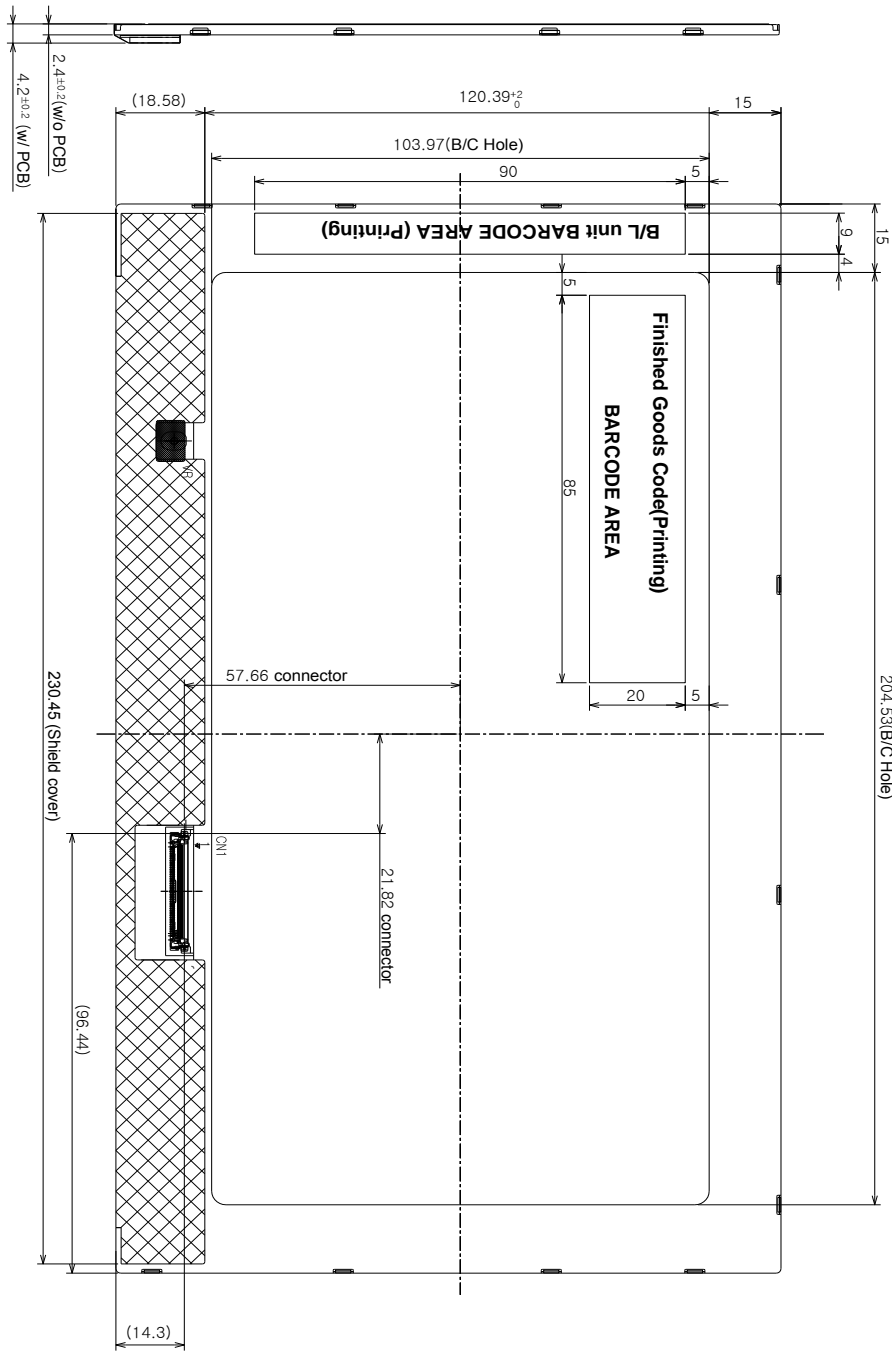


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2) Rear side

The tolerance, not show in the figure, is $\pm 0.2\text{mm}$.

[Unit : mm]



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8. OPTICAL CHARACTERISTICS

Ta=25°C , VDD=3.3V

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE	
Contrast Ratio	CR	$\theta = \psi = 0^\circ$	600	800	--	--	*1) 2)	
Luminance (C)	L	$\theta = \psi = 0^\circ$	300	400	--	cd/m ²	*1) 3)	
Uniformity(5P)	ΔL	$\theta = \psi = 0^\circ$	80	--	--	%	*1) 3)	
Uniformity(13P)	ΔL	$\theta = \psi = 0^\circ$	70	--	--	%	*1) 3)	
Response Time	Tr+Tf	$\theta = \psi = 0^\circ$	--	30	50	ms	*5)	
Cross talk	CT	$\theta = \psi = 0^\circ$	--	--	2.5	%	*6)	
View angle	Horizontal	Ψ	$CR \geq 10$	80/-80	85/-85	--	°	*4)
	Vertical	θ		80/-80	85/-85	--	°	*4)
Color Temperature Coordinate	W	X	$\theta = \psi = 0^\circ$	0.283	0.313	0.343	--	*3)
		Y		0.299	0.329	0.359		
	R	X		0.586	0.616	0.646	--	
		Y		0.304	0.334	0.364		
	G	X		0.310	0.340	0.370	--	
		Y		0.539	0.569	0.599		
B	X	0.119	0.149	0.179	--			
	Y	0.086	0.116	0.146				
Gamut		$\theta = \psi = 0^\circ$	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=15.67mA(each LED)

Definition of these measurement items is as follows:

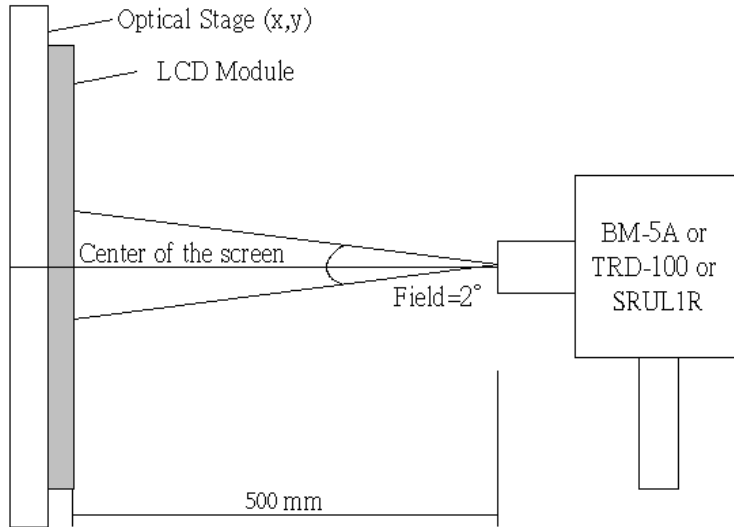
***1) Setup of Measurement Equipment**

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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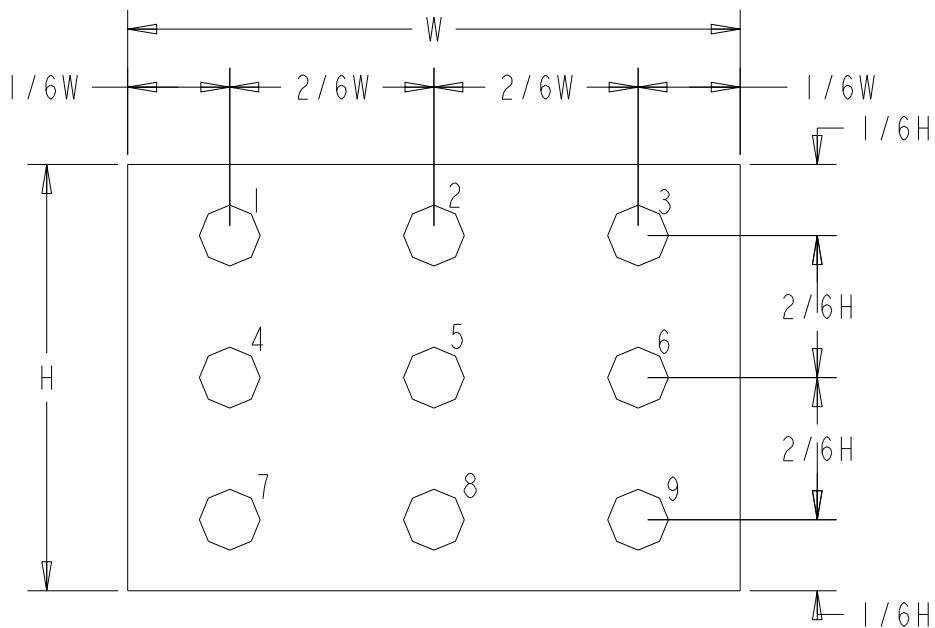
***2) Definition of Contrast Ratio**

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



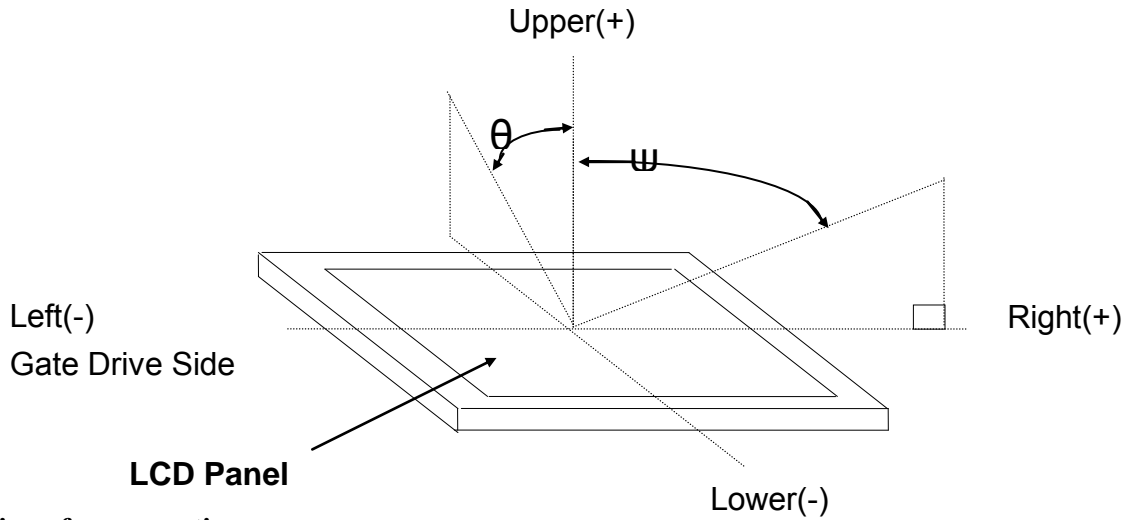
***3) Definition of Luminance and Luminance uniformity**

Central luminance: The white luminance is measured at the center position “5” on the screen, see Fig.1 below.
 5P Luminance (AVG): The white luminance is measured at measuring points 2、4、5、6、8, see Fig.1 below.
 9P Uniformity: $\Delta L = (L_{min} / L_{max}) \times 100\%$

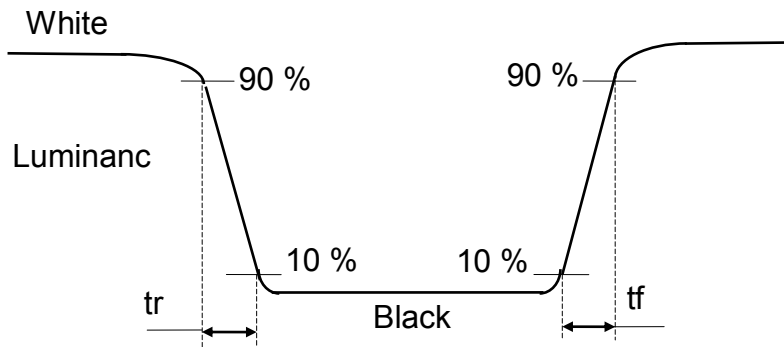


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***4) Definition of view angle(θ , ψ)**



***5) Definition of response time**



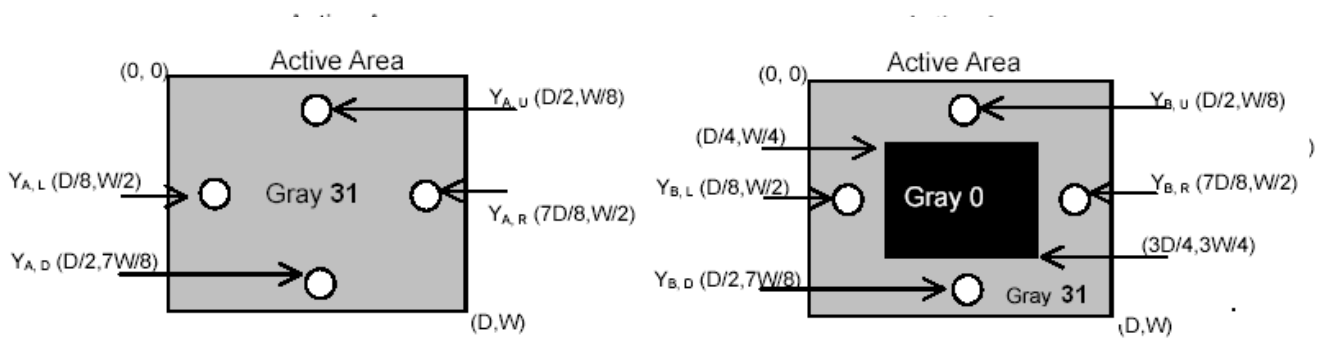
***6) Crosstalk Modulation Ratio:**

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

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)



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***7) Definition Gamma (Hydis)**

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、1、2-----60、63).

