Chunghwa Picture Tubes, Ltd.
Technical Specification

To	:	SCL
Date	:	2012/07/20

CPT TFT-LCD

CLAA101WJ01

Accepted by:

APPROVED BY	CHECKED BY	PREPARED BY

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Modification Record List

NO.	Issue Date	Modification Index
1	2012/02/07	First Edition
2	2012/05/22	Second Edition
3	2012/06/01	Modify Module Size (Page4)
4	2012/07/09	Add package method
5	2012/07/11	Modify color temperature coordinate (Page 17)
6	2012/7/20	Modify Mechanical Specification(P15 ,P16)

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1. OVERVIEW

CLAA101WJ01 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	35ms (Max)
Surface Treatment	HC
Viewing Angle	80°、80° / 80°、80°(Min) 89°、89° / 89°、89°(Typ.)
Brightness	Over driving mode Typ 700nit Min 630nit
Uniformity	9 point 75% min
Consumption of Power	0.65W (Max)
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.

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	℃	*1). 2). 3). 4)
Storage Temperature	Tstg	-25	65	℃	*1). 2). 3)

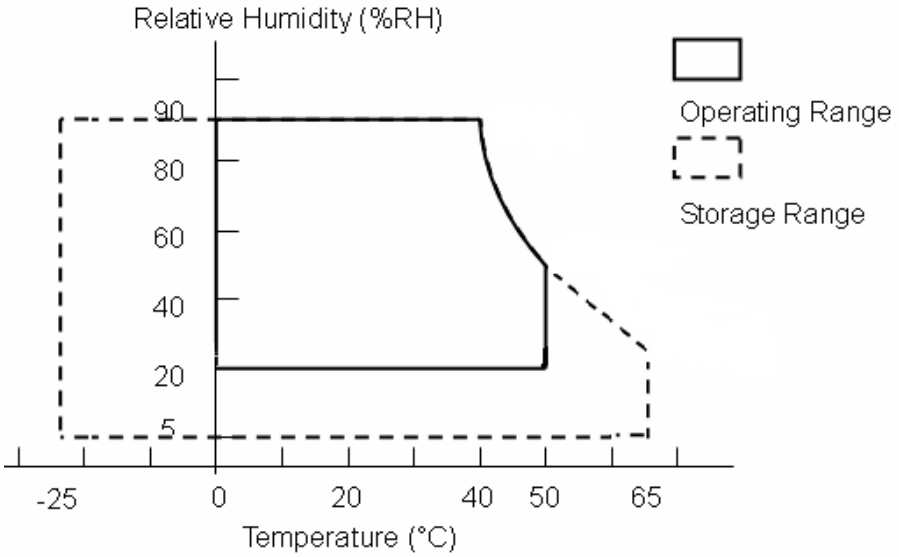
【Note】

*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

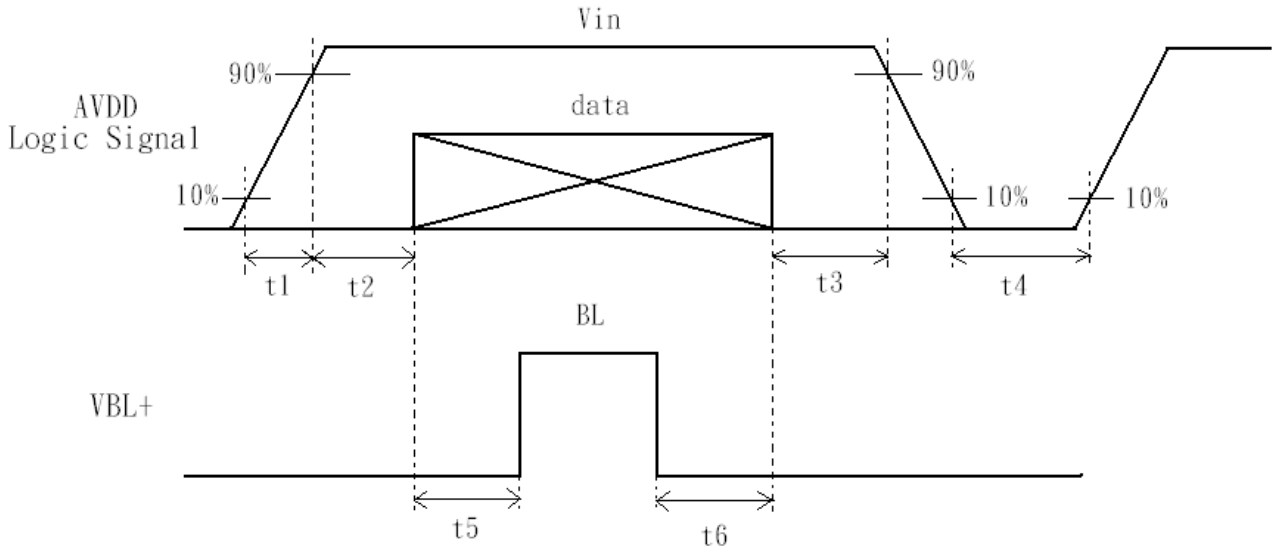
(A) TFT LCD

TEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LCD Power Voltage	VCC	3.0	3.3	3.6	V	*1)
LCD Power Current	ICC	-		153.3	mA	*2)
Rush Current	Irush	-	-	2	A	*3)

【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

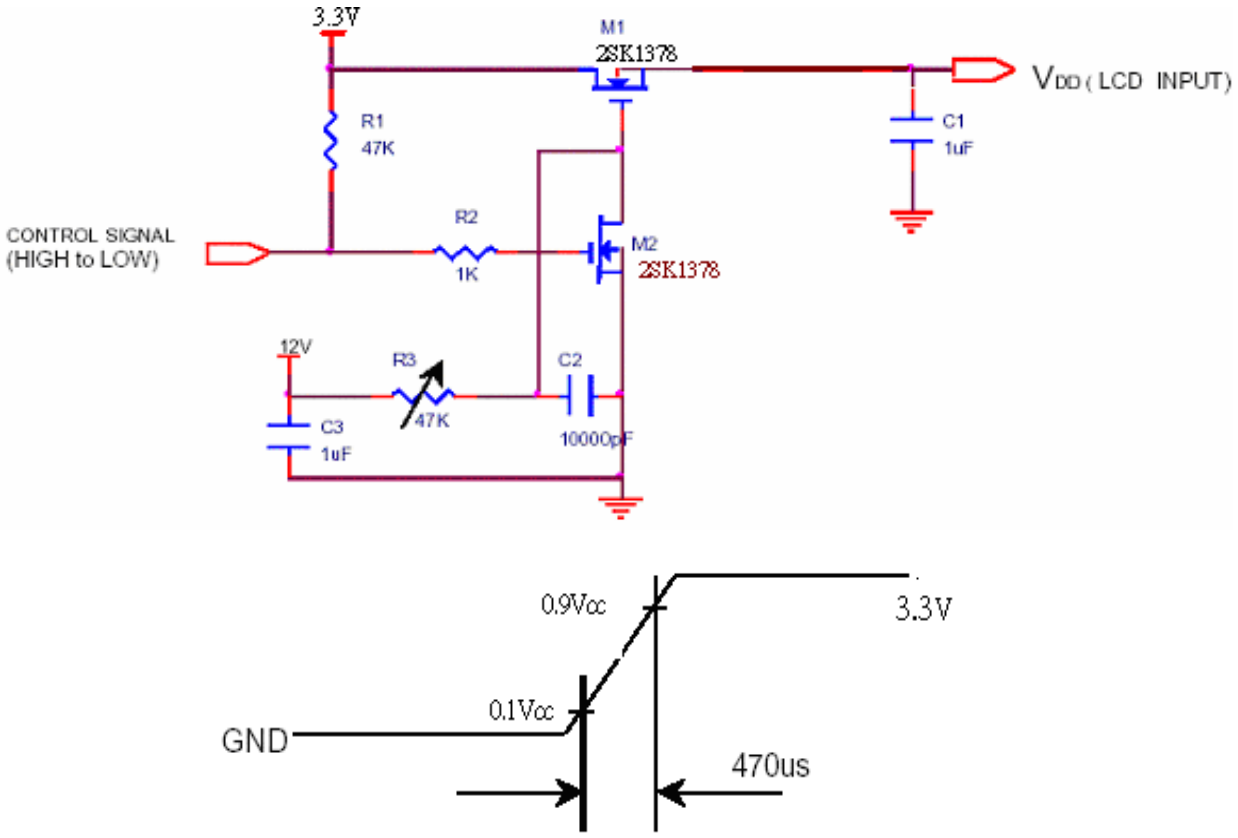


data:RGB DATA, DCLK, HD, VD, DENA

*2) The supply voltage is measured and specified at the interface connector of LCM.

(Test Pattern :5x5 mosaic pattern)

*3) Irush measure condition



(B) BACK LIGHT

(a.) ELECTRICAL CHARACTERISTICS

Ta=25℃

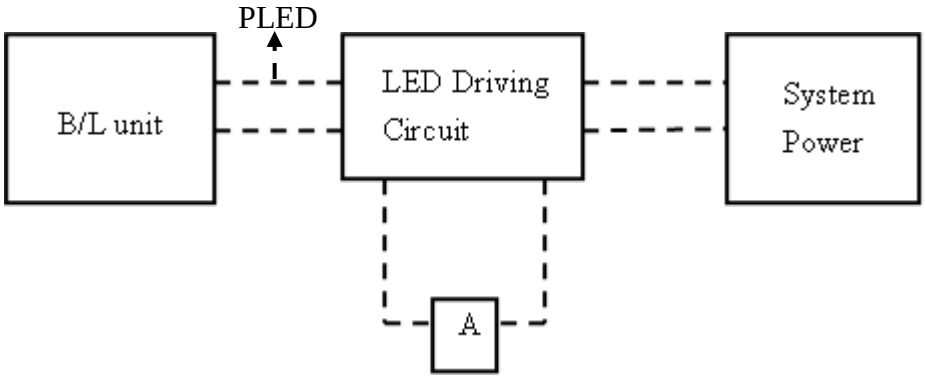
ITEM	SYMBOL	MIN	TYP	MAX	UNIT	NOTE
LED Driver Iuput Voltage	VBL+		16.8		V	
LED Driver Input Current	IBL+		99		mA	
Forward Voltage	VF	2.8	2.9	3.0	V	
Forward Current	IF		16.5		mA	*1)
Power consumption	PLED	-	2.71		W	*2)
PWM Frequency	PWM_BL	180	200	220	Hz	
Duty ratio	Dim	5		100	%	

(b) LED LIFE – TIME

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

*1). The VLED is calculated with 16.5mA normal driving mode.
-Vf : 2.9V/17.4V@26mA , Vi : 26mA/156mA over driving mode.
-The life time of LED at 26mA would be guaranteed for 4000hr.

Measure method：Forward Current is measured by utilizing a current meter as show below.



*2) Calculator value for reference $I_F \times V_F \times N$ = PLED

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

4. Connector Interface PIN & Function

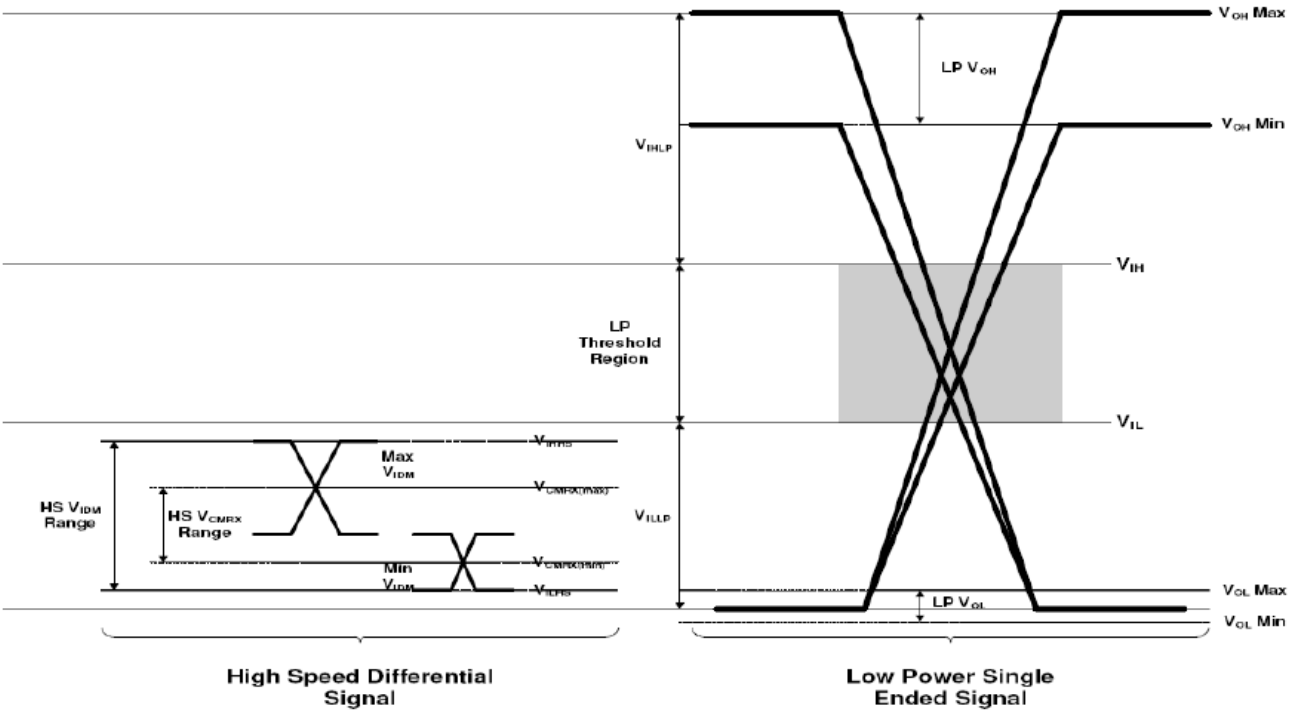
connector: AYF333935or equivalent

Pin No	symbol	description
1	VLED_VCC	Back light input power
2	VLED_VCC	
3	NC	BIST(Only for Aging)
4	VLED_Isink1	Current Sink for LED String
5	VLED_Isink2	
6	VLED_Isink3	
7	VLED_Isink4	
8	VLED_Isink5	
9	VLED_Isink6	
10	GND	GROUND
11	LEDPWM_MB	Back light PWM control, MB to Tcon
12	LEDPWM_Tcon	Back light PWM control, Tcon to MB
13	SDA	EDID data
14	SCL	EDID Clock
15	GND	GROUND
16	DSI_D2P	MIPI DATA(2Lane_P)
17	DSI_D2N	MIPI DATA(2Lane_N)
18	GND	GROUND
19	DSI_D1P	MIPI DATA(1Lane_P)
20	DSI_D1N	MIPI DATA(1Lane_N)
21	GND	GROUND
22	DSI_CLKP	MIPI CLOCK_P
23	DSI_CLKN	MIPI CLOCK_N
24	GND	GROUND
25	DSI_D0P	MIPI DATA(0Lane_P)
26	DSI_D0N	MIPI DATA(0Lane_N)
27	GND	GROUND
28	DSI_D3P	MIPI DATA(3Lane_P)
29	DSI_D3N	MIPI DATA(3Lane_N)
30	GND	GROUND
31	ID	reserved 0 ohm (size:0402 or 0201) to GND (default mount)
32	ID	reserved 0 ohm (size:0402 or 0201) to GND (default mount)
33	3V_VDD_EN	Enable logic 3V_VDD: High=enable; Low= disable,1.8V level
34	GND	GROUND
35	VDD	3.3V input
36	VDD	
37	VDD	
38	Core_VDD	1.2V input
39	Core_VDD	

5. INTERFACE TIMING CHART

(1)(a)MIPI Interface DC Characteristic

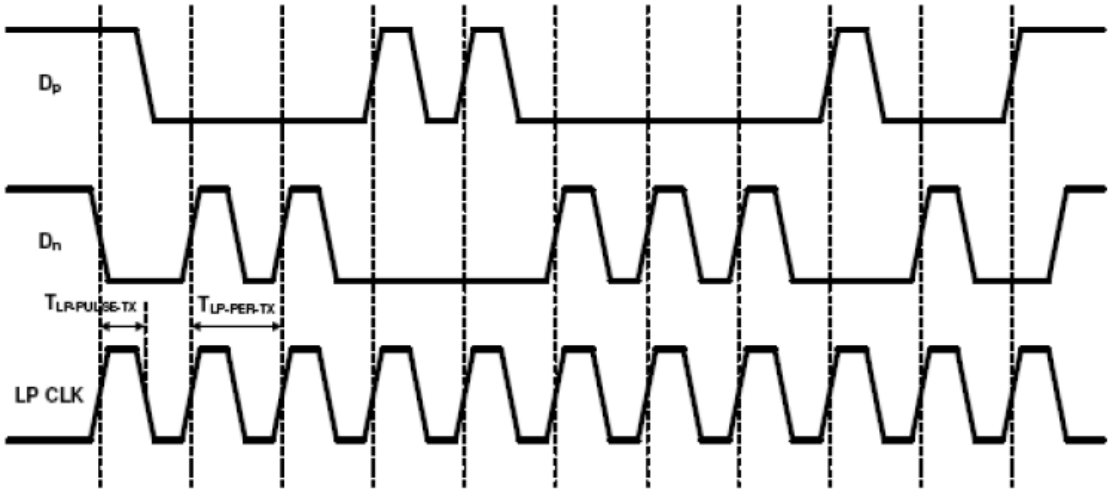
Parameter			Min.	Typ.	Max.	Unit	Remarks
Input data bit rate		BR_{MIPI}	200	-	1000	Mbps	
Differential Input impedance		Z_{ID}	80	100	125	Ω	
High speed Rx	Common-mode voltage	V_{CMRX}	70	-	330	mV	
	Differential input high threshold	V_{IDTH}	-	-	70	mV	
	Differential input low threshold	V_{IDTL}	-70	-	-	mV	
	Differential input voltage range	$\|V_{IDM}\|$	70	-	500	mV	
	Single-end input high voltage	V_{IHHS}	-	-	460	mV	
	Single-end input low voltage	V_{ILHS}	-40	-	-	mV	
Low Power Rx	Logic 1 input voltage	V_{IHLP}	880	-	-	mV	
	Logic 0 input voltage	V_{ILLP}	-	-	550	mV	
Low power Tx	Output high level	V_{OH}	1.08	1.2	1.32	V	
	Output low level	V_{OL}	-50	-	50	mV	



(b) MIPI Interface AC Characteristic

Parameter		Min.	Typ.	Max.	Unit	Remarks
Minimum pulse width response (LP Rx mode)	T_{MIN-RX}	50	-	-	ns	
Pulse width of the LP exclusive-OR clock	$T_{LP-PULSE-TX}$	50	55	58	ns	Note 1
15%~85% rise time and fall time (LP Tx mode)	T_{RLP} / T_{FLP}	-	-	25	ns	
30%~85% rise time and fall time of EOT (LP Tx mode)	T_{REOT}	-	-	35	ns	
Period of the LP exclusive-OR clock	$T_{LP-PER-TX}$	90	-	-	ns	
Data to clock setup time	T_{SETUP}	0.15	-	-	UI	
Data to clock setup time	T_{HOLD}	0.15	-	-	UI	

Note 1 : 1st clock pulse after STOP state or last clock pulse before STOP state/all other pulse



(2) Timing Chart

ITEM				SYNBOL	MIN	TYP	MAX	UNIT
LCD Timing	Frame Rate			-	TBD	60	TBD	Hz
	DCLK		Frequency	f_{CLK}	TBD	74	TBD	MHz
	DENA	Horizontal	Horizontal total time	t_H	TBD	1522	TBD	t_{CLK}
			Horizontal Active time	t_{HA}	TBD	1366	TBD	t_{CLK}
			Horizontal Blank time	t_{HB}	TBD	156	TBD	t_{CLK}
		Vertical	Vertical total time	t_V	TBD	810	TBD	t_H
			Vertical Active time	t_{VA}	TBD	768	TBD	t_H
			Vertical Blank time	t_{VB}	TBD	42	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							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	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	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	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	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	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	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	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	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	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	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	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	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	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	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	0
	GREEN(1)	0	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	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	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	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	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	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	0	1	0
	BLUE(254)	0	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	0	1	1	1	1	1	1	1	1

【Note】

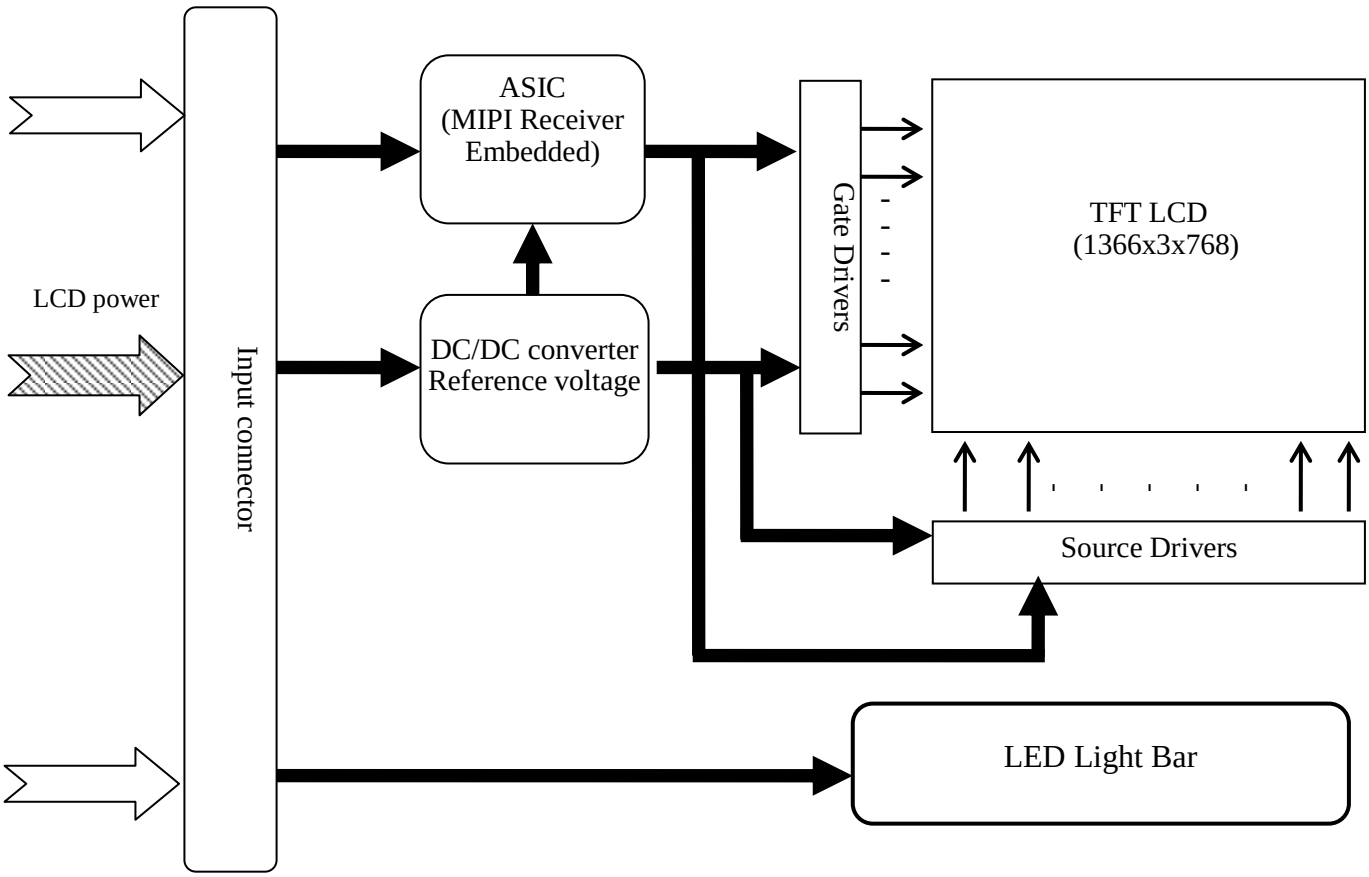
1) Gray level:

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

2) DATA:

1: high，0: low

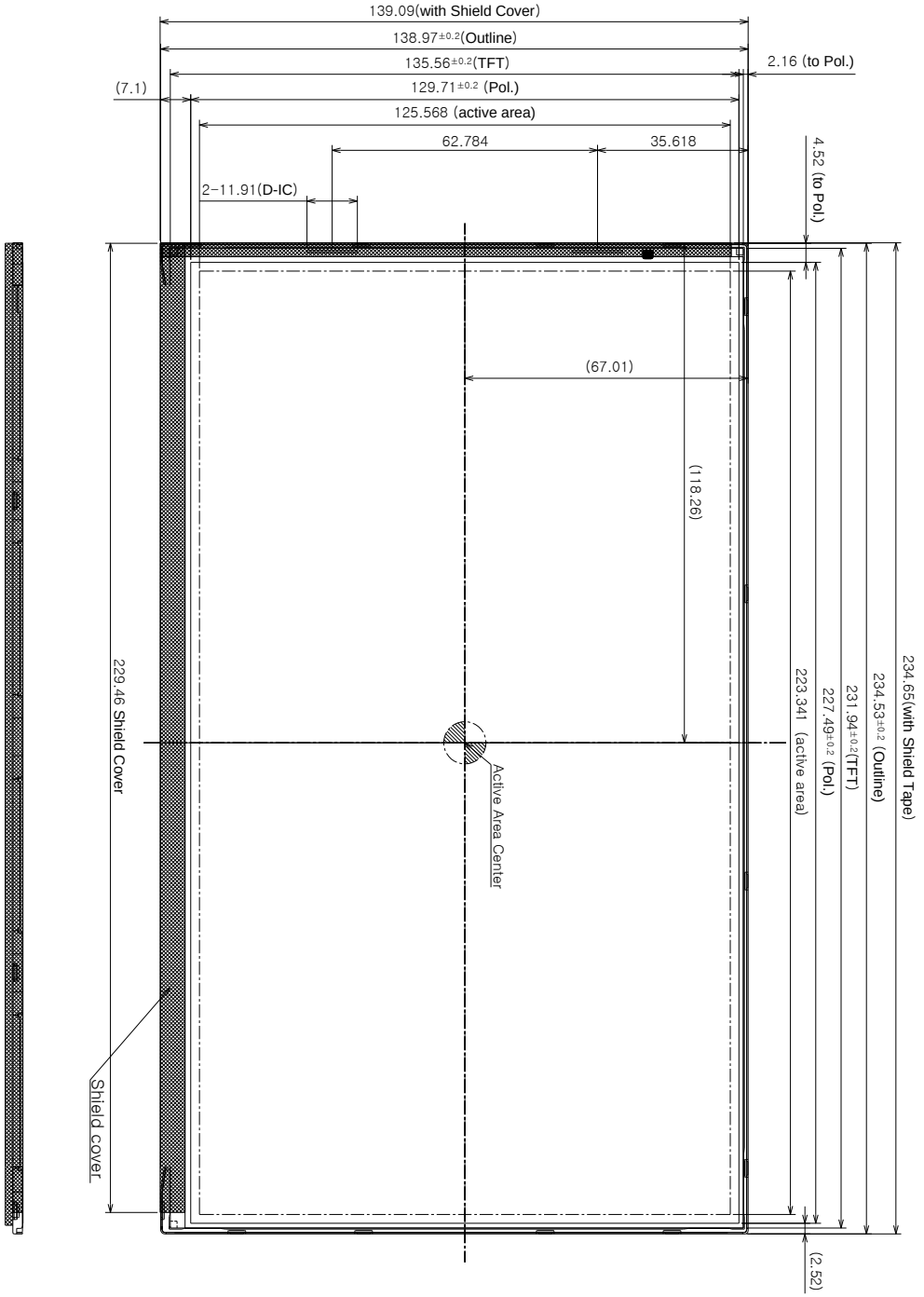
6. BLOCK DIAGRAM



7. MECHANICAL SPECIFICATION

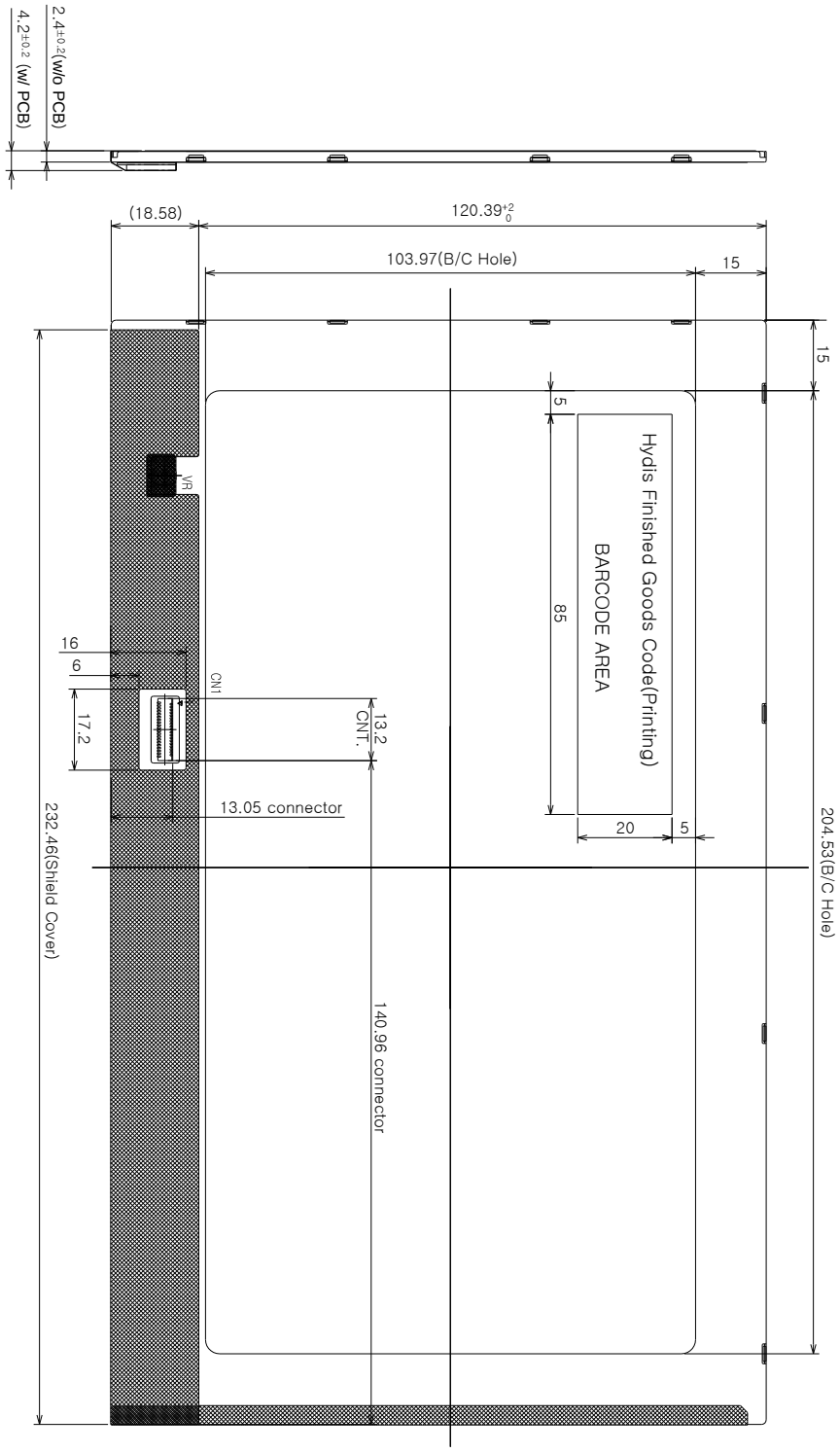
(1) Front side

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



2) Rear side

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



8. OPTICAL CHARACTERISTICS

Ta=25℃，VDD=3.3V

ITEM		SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT	NOTE
Contrast Ratio		CR	θ = ψ = 0°	800	--	--	--	*1) 2)
Luminance (C)		L	θ = ψ = 0°	405	450	--	cd/m^2	*1) 3)
Uniformity(9P)		ΔL	θ = ψ = 0°	75	--	--	%	*1) 3)
Response Time		Tr+Tf	θ = ψ = 0°	--	--	35	ms	*5)
Cross talk		CT	θ = ψ = 0°	--	--	2	%	*6)
View angle	Horizontal	Ψ	CR≧10	80/-89	85/-89	--	°	*4)
	Vertical	θ		80/-89	85/-89	--	°	*4)
Color Temperature Coordinate	W	X	θ = ψ = 0°	0.286	0.313	0.340	--	*3)
		Y		0.302	0.329	0.356		
	R	X		TBD	TBD	TBD	--	
		Y		TBD	TBD	TBD		
	G	X		TBD	TBD	TBD	--	
		Y		TBD	TBD	TBD		
	B	X		TBD	TBD	TBD	--	
		Y		TBD	TBD	TBD		
Gamut			θ = ψ = 0°	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=16.5mA(each LED)

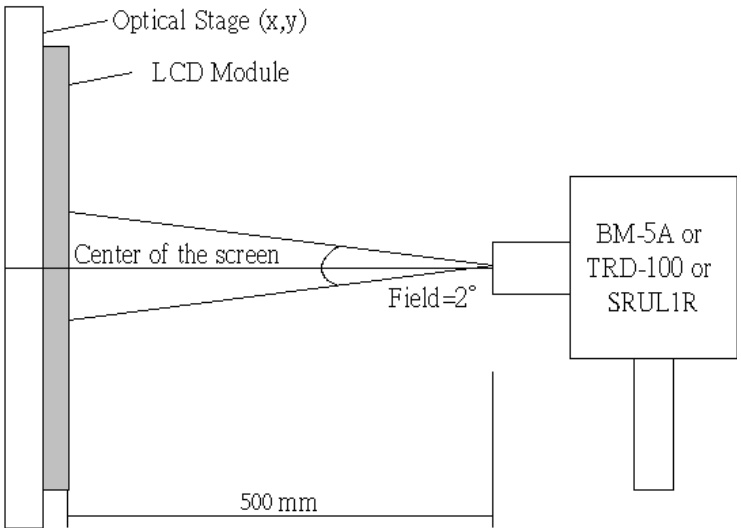
Definition of these measurement items is as follows:

*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

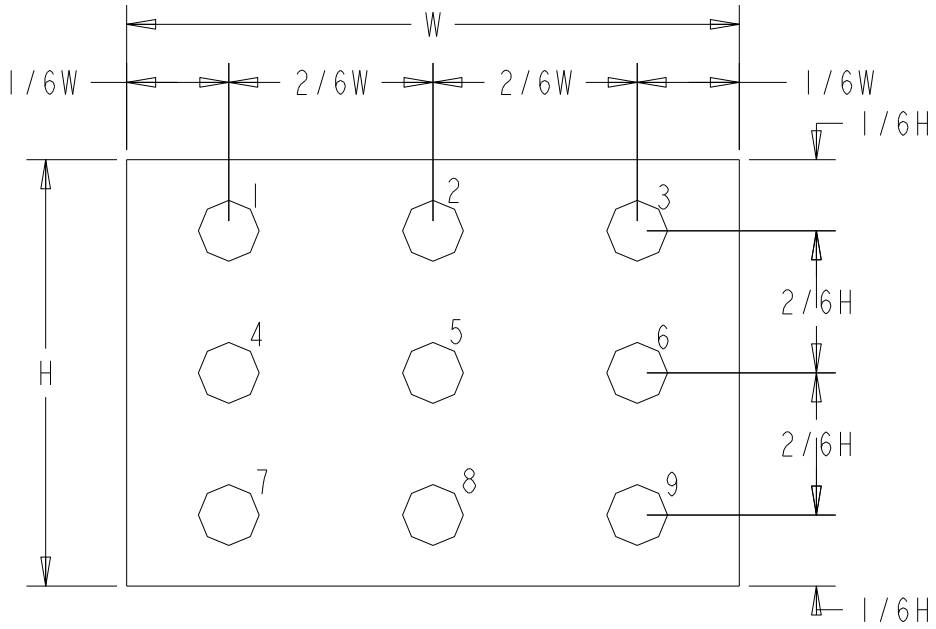


***3) Definition of Luminance and Luminance uniformity**

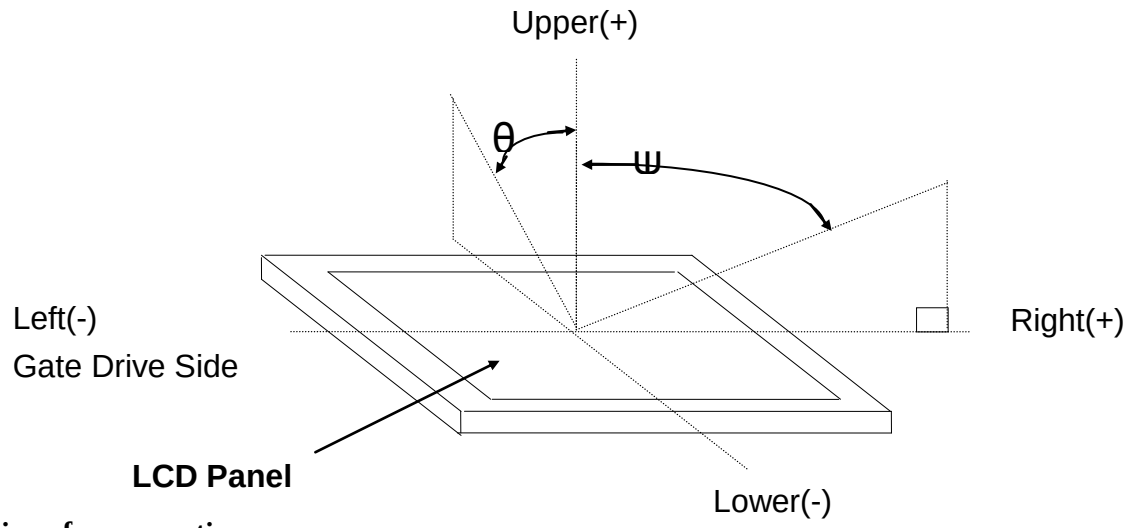
Central luminance: The white luminance is measured at the center position "5" on the screen, see Fig.1 below.

5P Luminance (AVG): The white luminance is measured at measuring points 2、4、5、6、8, see Fig.1 below.

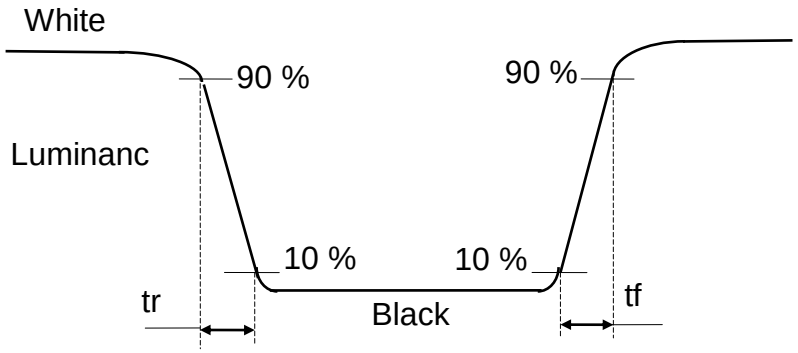
9P Uniformity: Δ L = (Lmin / Lmax) ×100%



***4) Definition of view angle(θ，ψ)**



***5) Definition of response time**



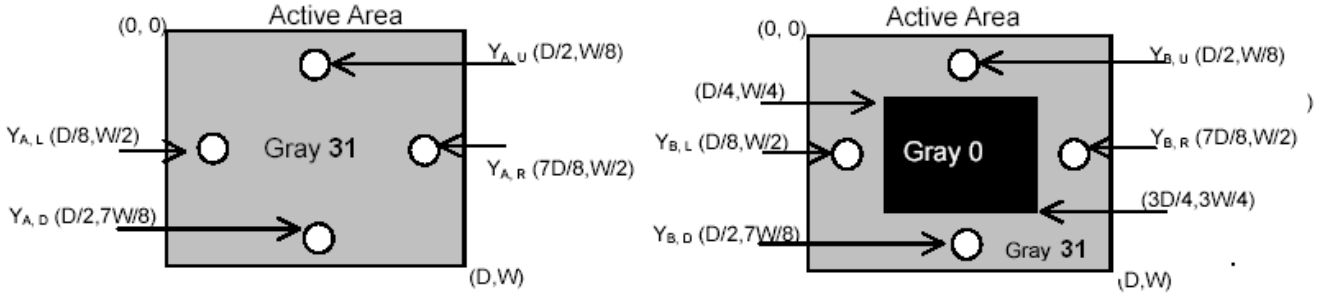
***6) Crosstalk Modulation Ratio:**

CT=｜Y_B-Y_A｜ / Y_{Ax}× 100%

Y_A、Y_B measure position and definition

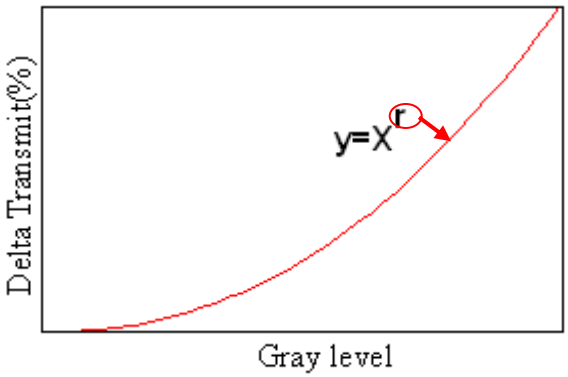
Y_A means luminance at gray level 31(exclude gray level 0 pattern)

Y_B means luminance at gray level 31(include gray level 0 pattern)



***7) Definition Gamma (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).



9. RELIABILITY TEST CONDITIONS

Test Items	Conditions
High Temp. Storage Test	80℃，240 Hrs
High Temp. Operating Test	60℃，240Hrs
Low Temp. Storage Test	-30℃，240 Hrs
Low Temp. Operating Test	-20℃，240 Hrs
High Temp/ High Humidity Operating Test	40℃，90% RH，240Hrs
High Temp./High Humidity Storage Test	60℃，90% RH ，240Hrs
Thermal Shock Test	-30℃(0.5 Hr)~70℃(0.5 Hr) 27 Cycles
Low Air Pressure Test	533mbar(100mbar/min ramp), "-40C~55C"(1C/min ramp)and 2hrs per each temperature
FPC Bending test	Bending degree is 180, bending 30 times and the bending radius is 1.0mm
FPC Insert/Remove test	30 times FPC insert/remove
Shock Test	980m/s2,Action time: 6ms, Time: 3 times for each direction, Direction:+/－X, +/－Y, +/－Z
ESD	Air +/－15KV ,contact +/－8KV , No damage
Package Vibration test	Frequency range: 10-55Hz, 1.2Grms, swep time: 1 minute, test period: 2 hours for each direction of X, Y, Z
Package Drop test	Height: 60cm, 1 corner, 3 edges, 6 surfaces: 1 time for each direction

【Note】

The judgment of the above test should be made as follow:

Pass：Normal display image with no obvious non-uniformity and no line defect.

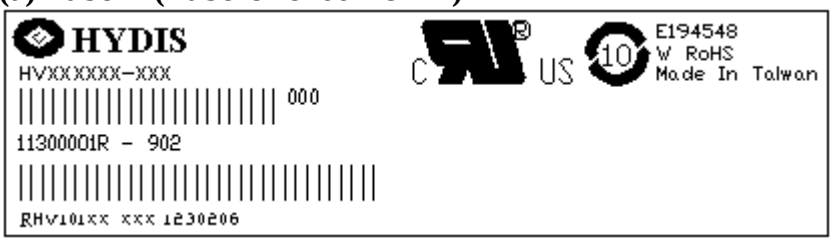
Partial transformation of the module parts should be ignored.

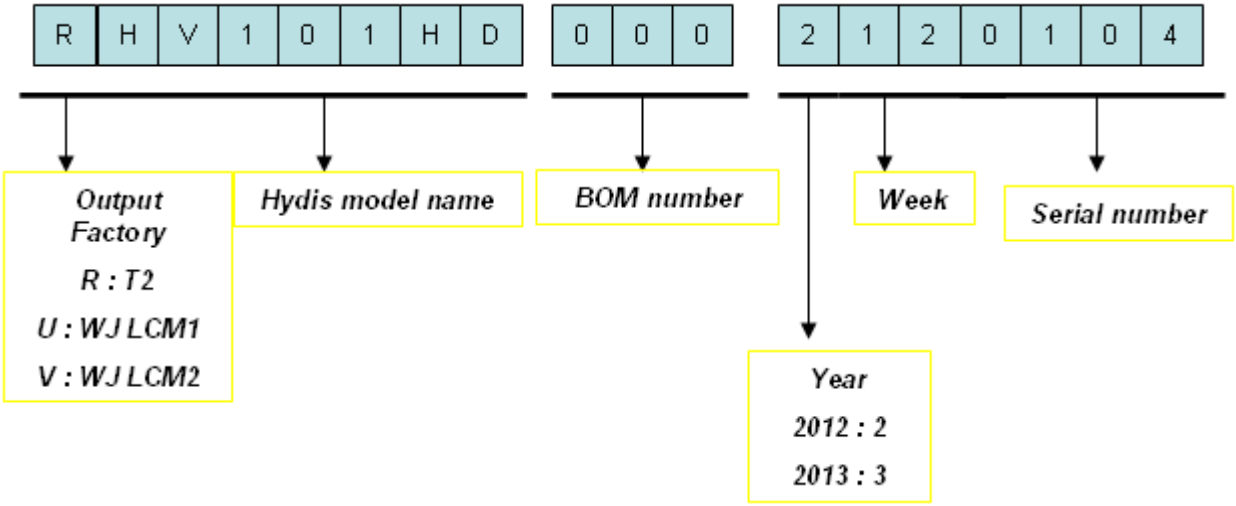
Fail：No display image, obvious non-uniformity, or line defects.

10. DESIGNATION OF LOT MARK

(1) Product label

(a) Label 1 (Label size=66x18mm)





(b) Label 2

Item	Description	Item	Description
HYDIS	COMPANY NAME	E194548	UL CODE
HVXXXXXX-XXX	Model name	W、ROHS	UL CODE、EUROPE ROHS MARK
XXX 902	Material code, customer code	Made in Taiwan	Manufacturing location
11300001R	barcode Manufacturing serial no		UL Mark
	ROHS Mark	RHV101XX XXX 1230206	customer code Explanation is as below

(i) barcode Manufacturing serial no

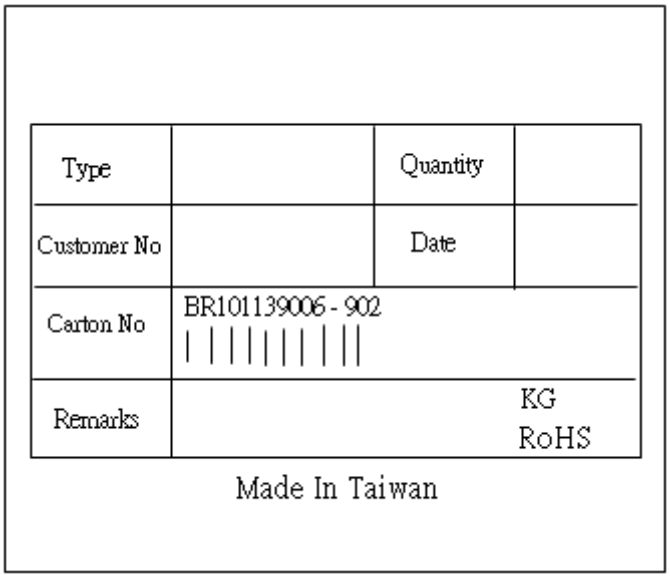
Example	1	1	3	0	0	0	0	1	R
code	1	2	3	4	5	6	7	8	9
definition	Year	Cycle		Water code					Manufacturer code

(ii) customer code Explanation is as below

Example	R	HV101XX	XXX	1	23	0206
code	1~2	3~7	8	9	10	11~12
definition	Manufacturer code	Model name	Material code	Year	Cycle	Water code

(2) Packing Label

(a) Box Label (size:80 x 70 mm)



Contents	DESCRIPTION
B	CELL Cost code
R	MDL Manufacturing code
101	MDL Size
1	Year
39	Cycle
006	Serial No
902	Customer Code

(b) Pallet label (size:80 x 70 mm)

Contents	DESCRIPTION
HYDIS	Company Name
HV101XXX-XXX	Type Name
XX CN，XXX PCS	Carton quantity，Number panel
XXXX/XX/XX	Year / Month / Day
BR101139006A - 902	BOX ID and Customer Code

(i) BOX ID Description ：

BR101139006A - 902

Contents	DESCRIPTION
B	CELL Cost code
R	MDL Manufacturing code
101	MDL Size
1	Year
39	Cycle
006	Serial No
A	Special code
902	Customer Code

11. PACKING INFORMATION

(1) Packing order

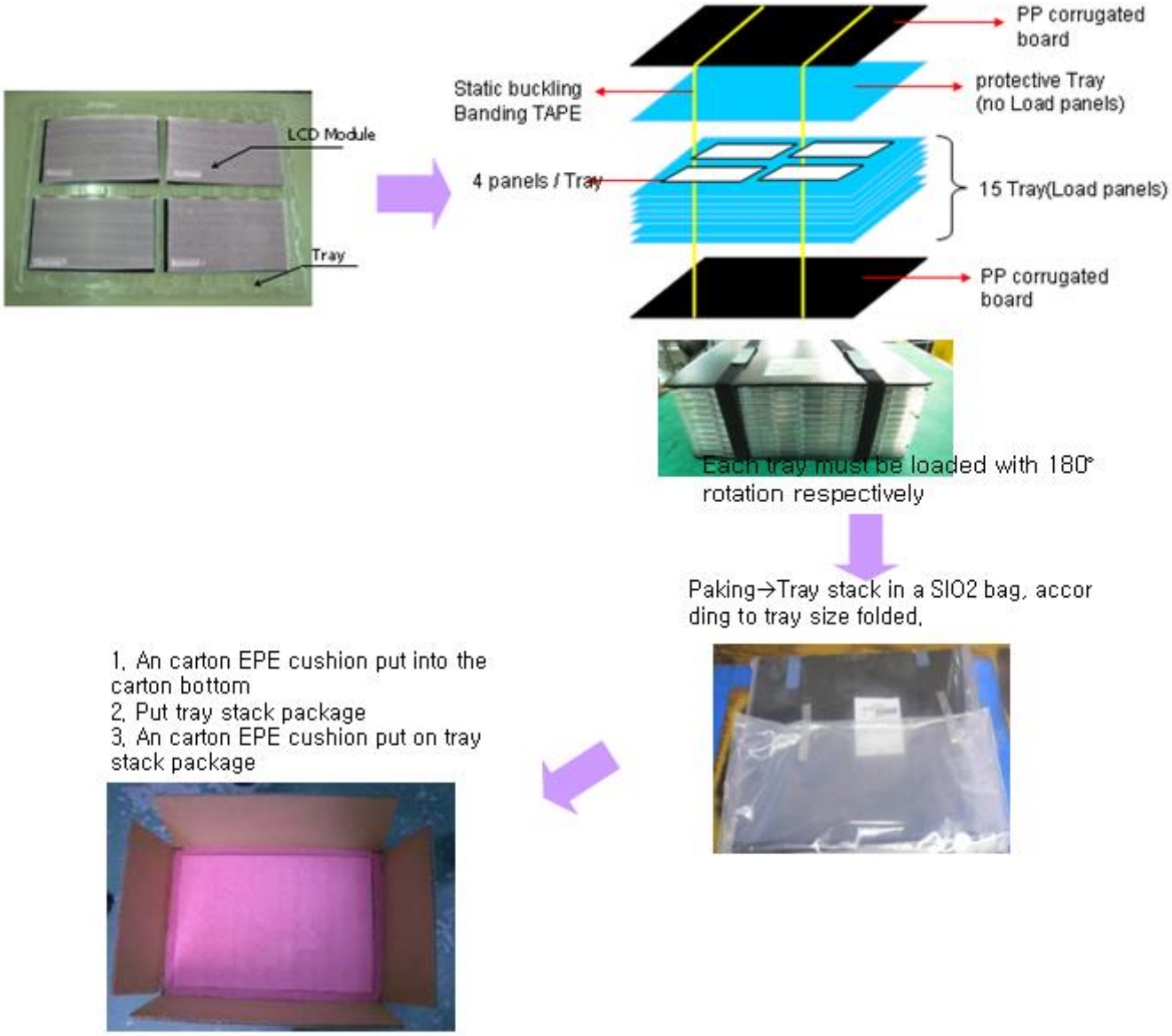


Figure2-1 packing method

Notes : 1. Box Dimension: 570mm(L) X 430mm(W) X 220mm(H)
2. Package Quantity in one Box : 60pcs
3. Tray Size : 540mm(L) X 400mm(W) X 0.8mm(H)

(2) Pallet Packing

PALLET specification

(1) 12 box (max.) / 1 pallet
(2) Pallet: 1150(L) X 900(W) X 130(H) mm
(3) Pallet stack: 1150(L) X 900(W) X920(H) mm
(4) Angle boards: L 790 X 50 X 50mm
(5) Gross Weight: 156Kg

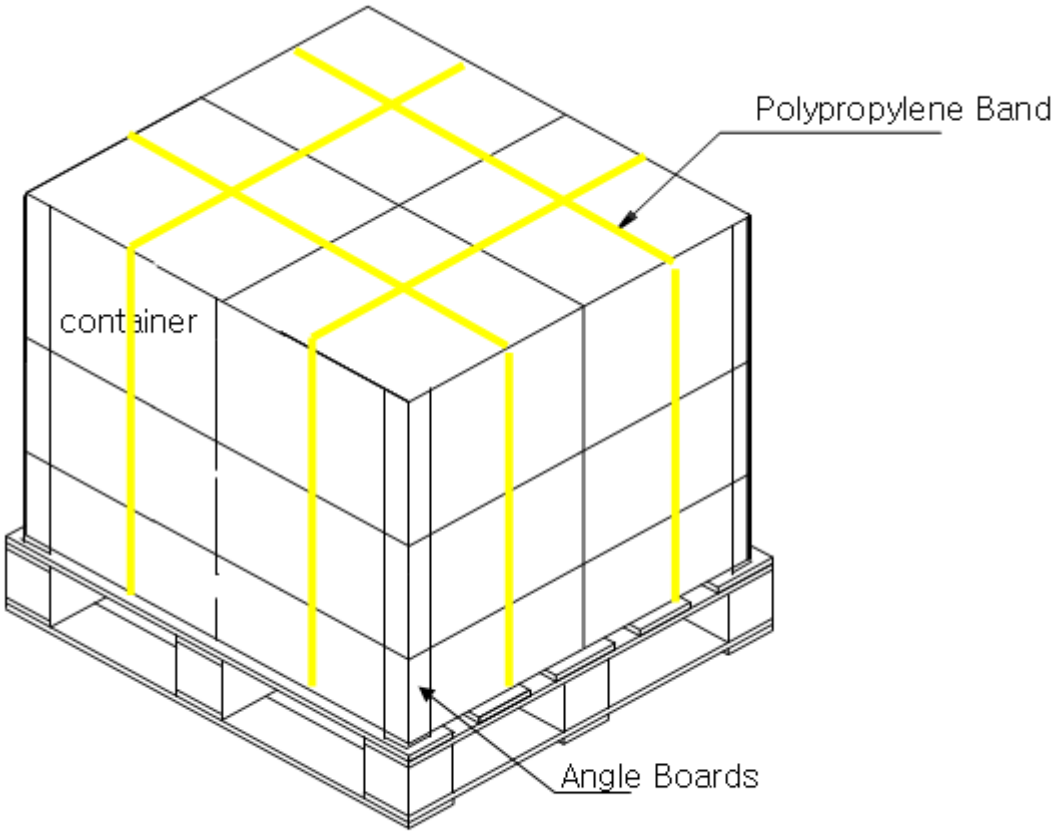


Figure2-2 packing method