



# CUSTOMER APPROVAL SHEET

<b>Company Name</b>	
<b>MODEL</b>	<b>A070VW05 V0</b>
<b>CUSTOMER APPROVED</b>	Title :  Name :

- APPROVAL FOR SPECIFICATIONS ONLY (Spec. Ver. \_\_\_\_)
- APPROVAL FOR SPECIFICATIONS AND ES SAMPLE (Spec. Ver. \_\_\_\_)
- APPROVAL FOR SPECIFICATIONS AND CS SAMPLE (Spec. Ver. \_\_\_\_)
- CUSTOMER REMARK :

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Doc. version :	0.3
Total pages :	23
Date :	2008/11/13

# Product Specification

## 7.0" COLOR TFT-LCD MODULE/PANEL

**Model Name :** **A070VW05 V0**

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<b>Planned Lifetime:</b>	From 2008/Sep To 2010/Dec
<b>Phase-out Control:</b>	From 2010/Jul To 2010/Dec
<b>EOL Schedule:</b>	2010/Dec

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- < ◆ > Preliminary Specification
- < > Final Specification

Note: The content of this specification is subject to change.

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Record of Revision

Version	Revise Date	Page	Content
0.0	2008/08/07		First Draft
0.1	2008/09/17	3 6 6-9 8-10 10 11-12 18 22	Correct "A. General Information". Delete recommended connector. Change panel pin definition of GND. Modify Max capability and driving condition of VLED and LEDPWM. Correct symbol of "t <sub>est</sub> " and "T <sub>ehd</sub> ". Update input timing. Update ESD driving condition. Add item 22 of "H. Precautions".
0.2	2008/9/25	4-5 10	Update Clear drawing. Correct "LEDPWM frequency".
0.3	2008/11/13	3 4, 5 9 11 14 17 22	Update weight and power consumption. Add protect film and change label position. Update "Current Consumption". Update "Horizontal Input Timing". Update optical spec: contrast ratio, viewing angle, white chromaticity. Correct "Vibration" test condition. Add "system block example".

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### A. General Information

A070VW05 V0 is an a-Si type Thin Film Transistor Liquid crystal Display (TFT-LCD). This model is composed of a TFT-LCD, driver IC, FPC (flexible printed circuit), PCB with LCD driving circuit, and a backlight unit. This product is mainly for car after-market, and other suitable application.

NO.	Item	Unit	Specification	Remark
1	Screen Size	inch	7.0(Diagonal)	
2	Display Resolution	dot	800RGB(H)×480(V)	
3	Overall Dimension	mm	165(H) × 104(V) × 5.465(T)	Note 1
4	Active Area	mm	152.40(H)×91.44(V)	
5	Pixel Pitch	mm	0.1905(H)×0.1905(V)	
6	Color Configuration	--	R. G. B. Stripe	Note 2
7	Color Depth	--	16.7M Colors	Note 3
8	NTSC Ratio	%	50	
9	Display Mode	--	Normally White	
10	Panel surface Treatment	--	Anti-Glare, 3H	
11	Weight	g	132	
12	Power Consumption	W	2.5	Note 4
13	Viewing direction		6 o'clock (gray inversion)	

Note 1: Not include FPC and protect film. Refer next page to get further information.

Note 2: Below figure shows dot stripe arrangement.



Note 3: The full color display depends on 24-bit data signal (pin 5~28).

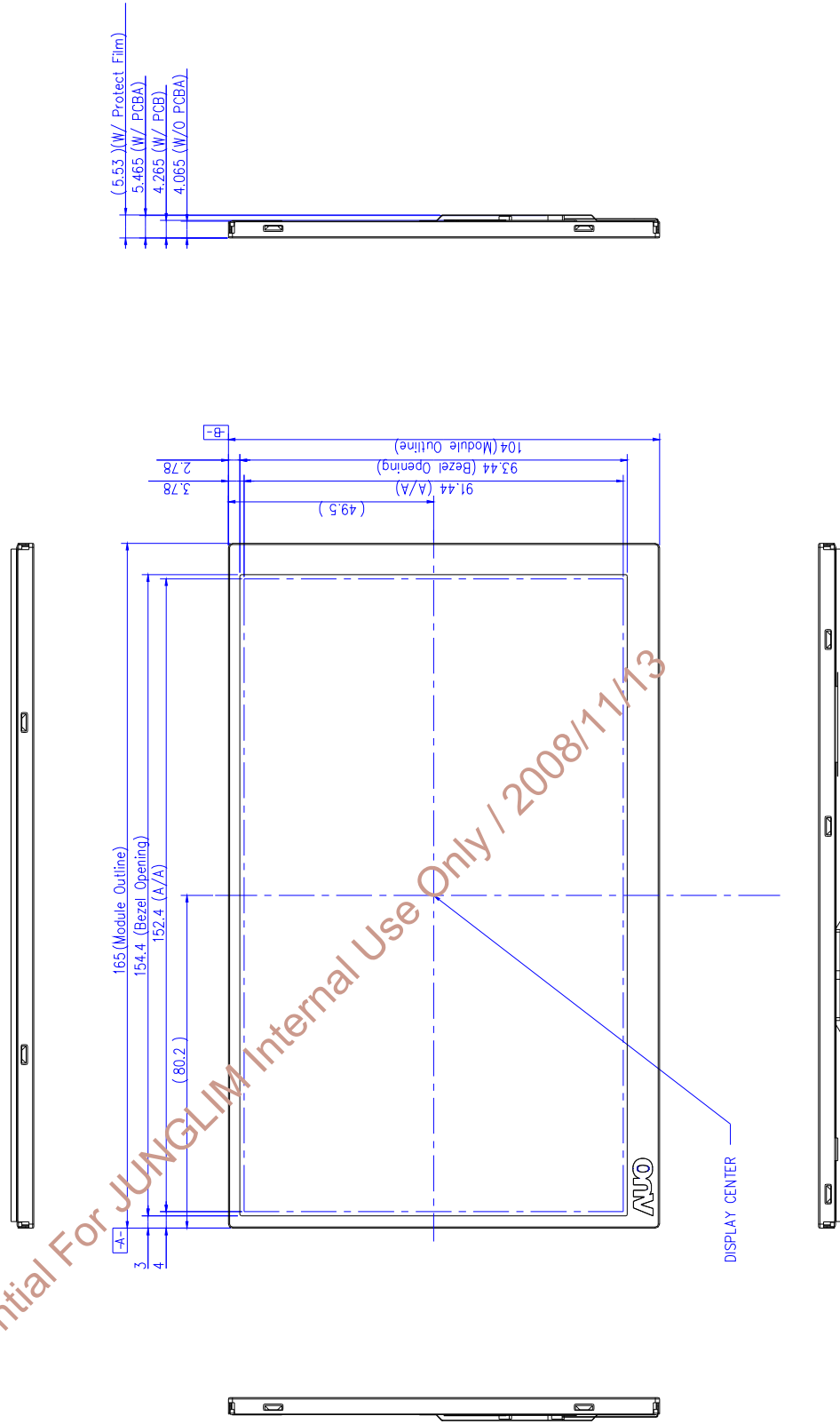
Note 4: Please refer to **typical condition driving** in Electrical Characteristics chapter.

## B. Outline Dimension

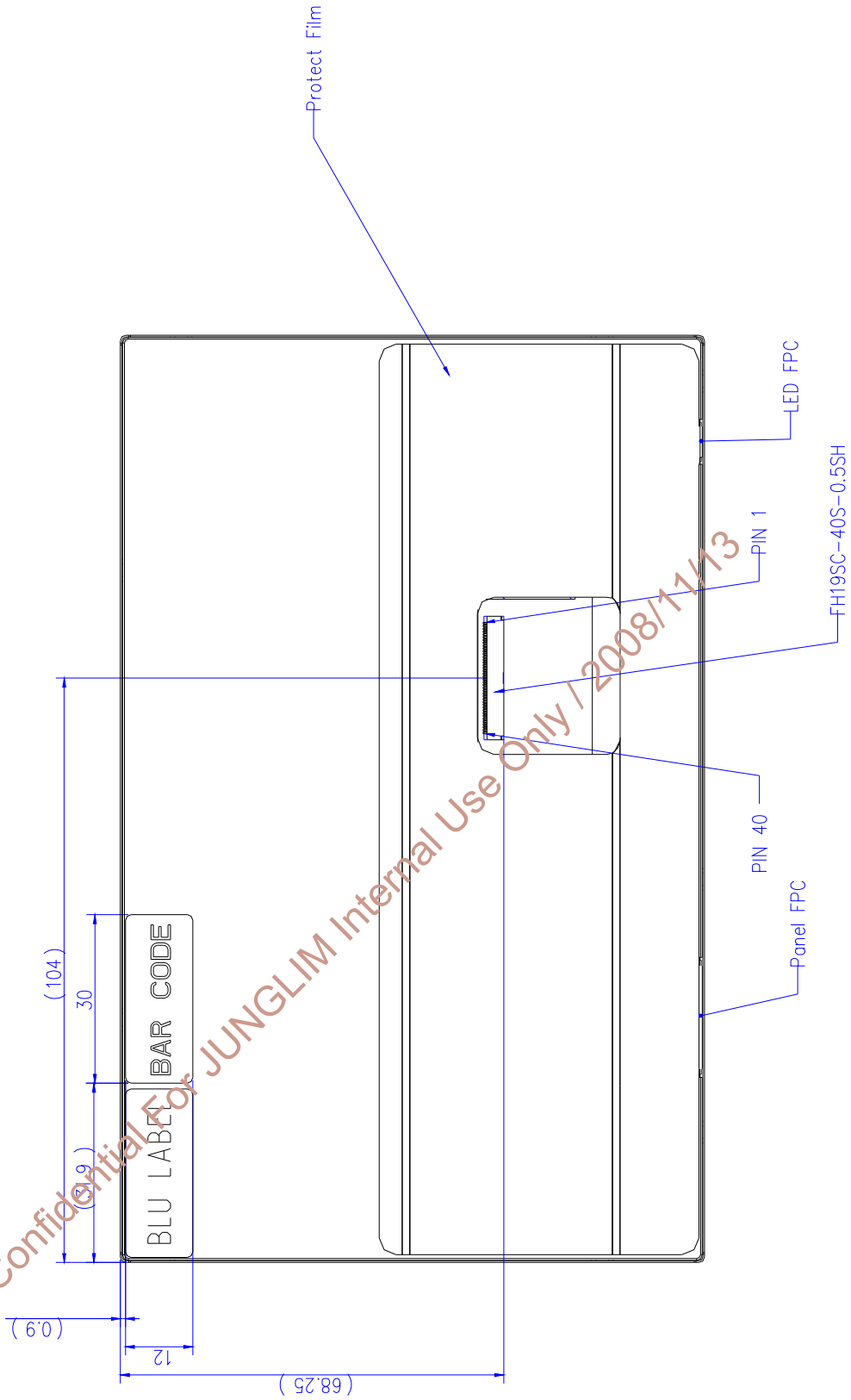
### 1. TFT-LCO Module – Front View

**Notes:**

1. General tolerance is  $\pm 0.3$
2. The bending radius of FPC should be larger than 0.6



**2. TFT-LCD Module – Rear View**



## C. Electrical Specifications

### 1. TFT LCD Panel Pin Assignment

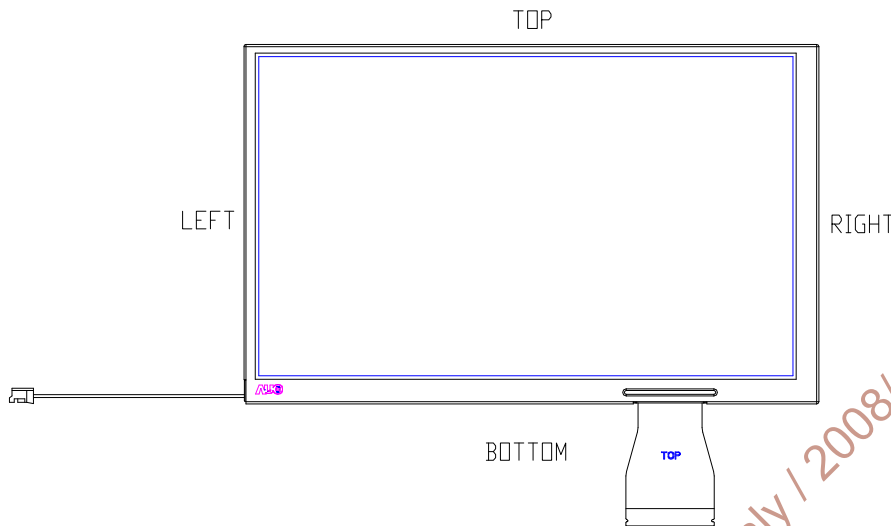
Pin no	Symbol	I/O	Description	Remark
1	GND	P	System Ground	Note 1
2	GND	P	System Ground	Note 1
3	VCC	P	System Power Supply	
4	VCC	P	System Power Supply	
5	DR0	I	Graphic Data R0 (LSB)	
6	DR1	I	Graphic Data R1	
7	DR2	I	Graphic Data R2	
8	DR3	I	Graphic Data R3	
9	DR4	I	Graphic Data R4	
10	DR5	I	Graphic Data R5	
11	DR6	I	Graphic Data R6	
12	DR7	I	Graphic Data R7 (MSB)	
13	DG0	I	Graphic Data G0 (LSB)	
14	DG1	I	Graphic Data G1	
15	DG2	I	Graphic Data G2	
16	DG3	I	Graphic Data G3	
17	DG4	I	Graphic Data G4	
18	DG5	I	Graphic Data G5	
19	DG6	I	Graphic Data G6	
20	DG7	I	Graphic Data G7 (MSB)	
21	DB0	I	Graphic Data B0 (LSB)	
22	DB1	I	Graphic Data B1	
23	DB2	I	Graphic Data B2	
24	DB3	I	Graphic Data B3	
25	DB4	I	Graphic Data B4	
26	DB5	I	Graphic Data B5	
27	DB6	I	Graphic Data B6	
28	DB7	I	Graphic Data B7 (MSB)	
29	GND	P	System Ground	Note 1
30	DCLK	I	Data clock Input	
31	NC	-	No connection. Please leave it open	
32	HSYNC	I	Horizontal sync input	
33	VSYNC	I	Vertical sync input	
34	DE	I	Data enable Input (Low active)	



35	VLED	P	LED Circuit power supply	
36	VLED	P	LED Circuit power supply	
37	GND	P	System Ground	Note 1
38	GND	P	System Ground	Note 1
39	LEDPWM	I	LED system PWM signal	
40	GNDLED	P	GND for LED Circuit	Note 1

I: Input pin; P: Power pin; G: Ground pin;

Note 1. GND and GNDLED are connected together in AUO module.



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## 2. Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power voltage	VCC	GND=0	-0.5	5.0	V	System Power Supply
	VLED	LEDGND	-0.5	6.0	V	LED Circuit Power Supply
Input signal voltage	Data	GND=0	-0.3	3.6	V	Digital Signals

Note 1: Functional operation should be restricted under ambient temperature (25°C).

Note2: Maximum ratings are those values beyond which damages to the device may occur. Functional operation should be restricted to the limits in the Electrical Characteristics chapter.

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### 3. Electrical DC Characteristics

#### a. Typical Operation Condition (GND = GNDLED = 0V)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power Voltage		VCC	3.0	3.3	3.6	V	System Power Supply
		VLED	4.5	5.0	5.5	V	LED Circuit Power Supply
Input Signal Voltage	H Level	V <sub>IH</sub>	0.7xVCC	--	VCC	V	
	L Level	V <sub>IL</sub>	GND	--	0.3xVCC	V	

#### b. Current Consumption (LEDGND=GND=0V)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Input Current for VCC	I <sub>VCC</sub>	VCC = 3.3V	-	120	150	mA	Note 1, 2
Input Current for VLED	I <sub>VLED</sub>	VLED = 5.0V	-	420	450	mA	Note 1, 2

Note 1: Test Condition is under typical Electrical DC and AC characteristics.

Note 2: Test pattern is the following picture.

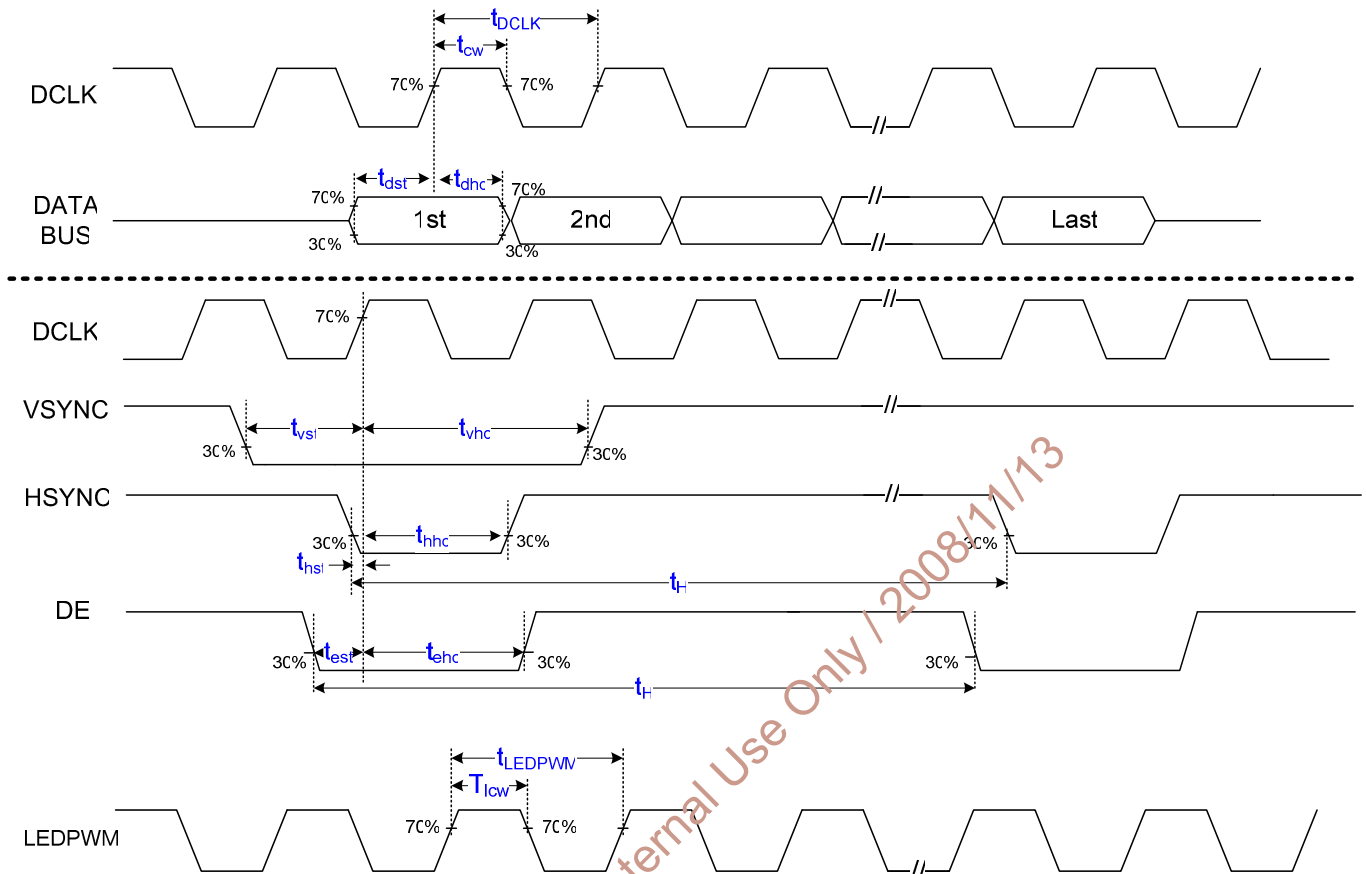


### 4. Electrical AC Characteristics

#### a. Signal AC Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK duty cycle	--	40	50	60	%	$t_{cw} / t_{DCLK} \times 100\%$
VSYNC setup time	t <sub>vst</sub>	0	--	--	ns	
VSYNC hold time	t <sub>vhd</sub>	2	--	--	ns	
HSYNC setup time	t <sub>hst</sub>	5	--	--	ns	
HSYNC hold time	t <sub>hhd</sub>	10	--	--	ns	

Data Enable setup time	$t_{est}$	4			ns	
Data Enable hold time	$T_{ehd}$	2			ns	
Data setup time	$t_{dst}$	5	--	--	ns	
Data hold time	$t_{dhd}$	10	--	--	ns	
LEDPWM frequency	--	1	--	20	kHz	
LEDPWM duty cycle	--	10	--	--	%	$t_{icw} / t_{LEDPWM} \times 100\%$



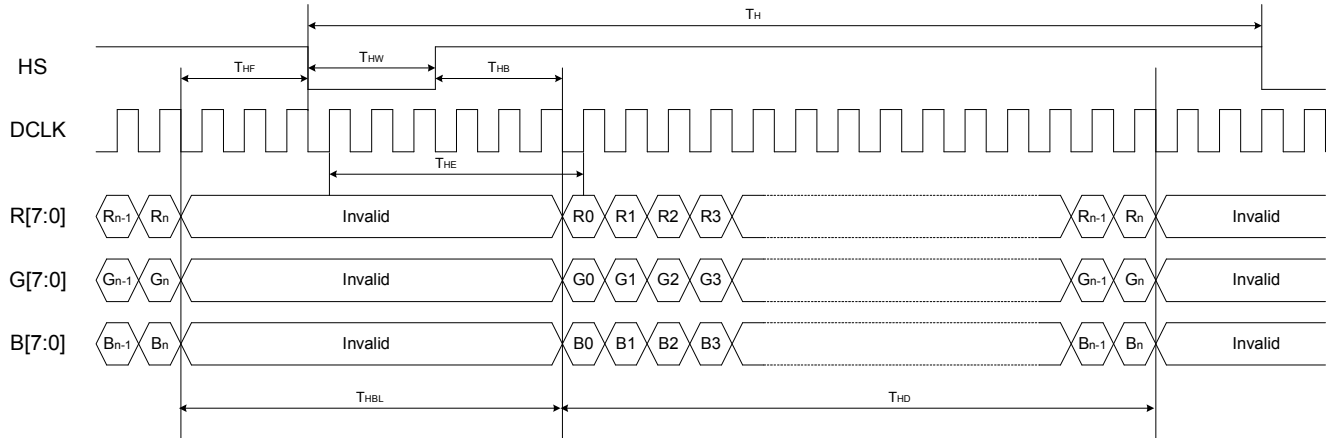
$t_H$ : HSYNC period

$t_{DCLK}$ : DCLK period

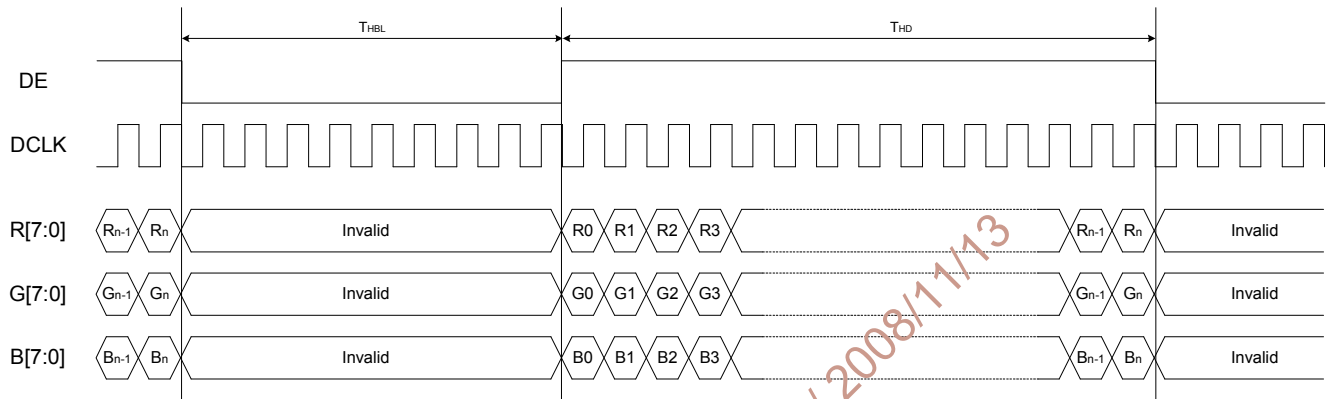
$t_{cw}$ : the width of DCLK high

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### b. Input Timing



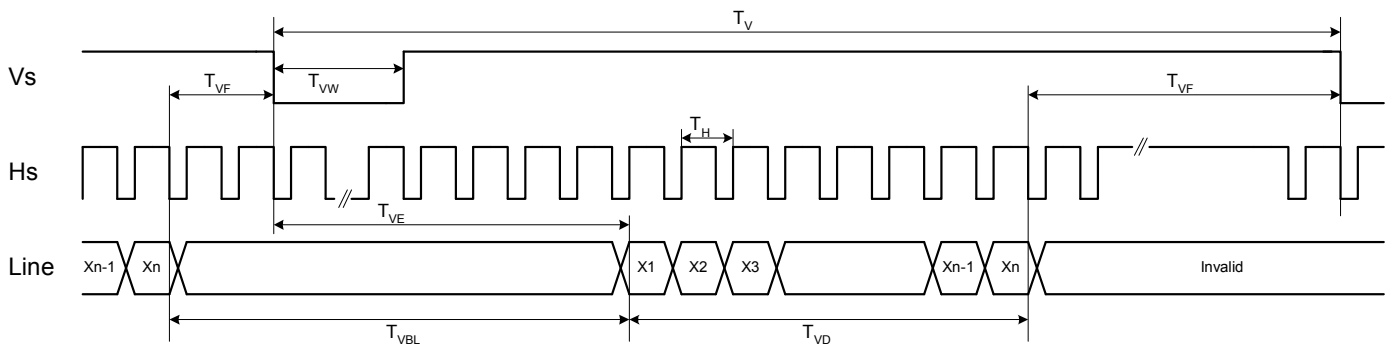
Horizontal input timing. (HV mode)



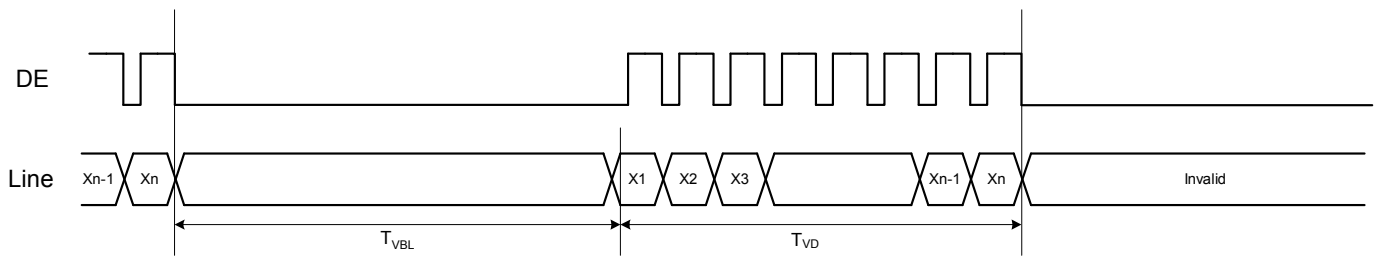
Horizontal input timing. (DE mode)

#### Horizontal Input Timing

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK frequency	FDCLK	25	33	40	MHz	
DCLK period	TDCLK	25	30.3	40	ns	
Hsync Period (=THD+THBL)	TH	--	1056	1088	DCLK	
Active Area	THD	--	800	--	DCLK	
Horizontal Blanking	THBL	--	256	288	DCLK	
Hsync Front Porch	THF	--	40	72	DCLK	
Delay from Hsync to 1 <sup>st</sup> data	THE	--	216	--	DCLK	
Hsync Pulse Width	THW	1	128	136	DCLK	
Hsync Back Porch	THB	80	88	215	DCLK	



**Vertical timing. (HV mode)**



**Vertical timing. (DE mode)**

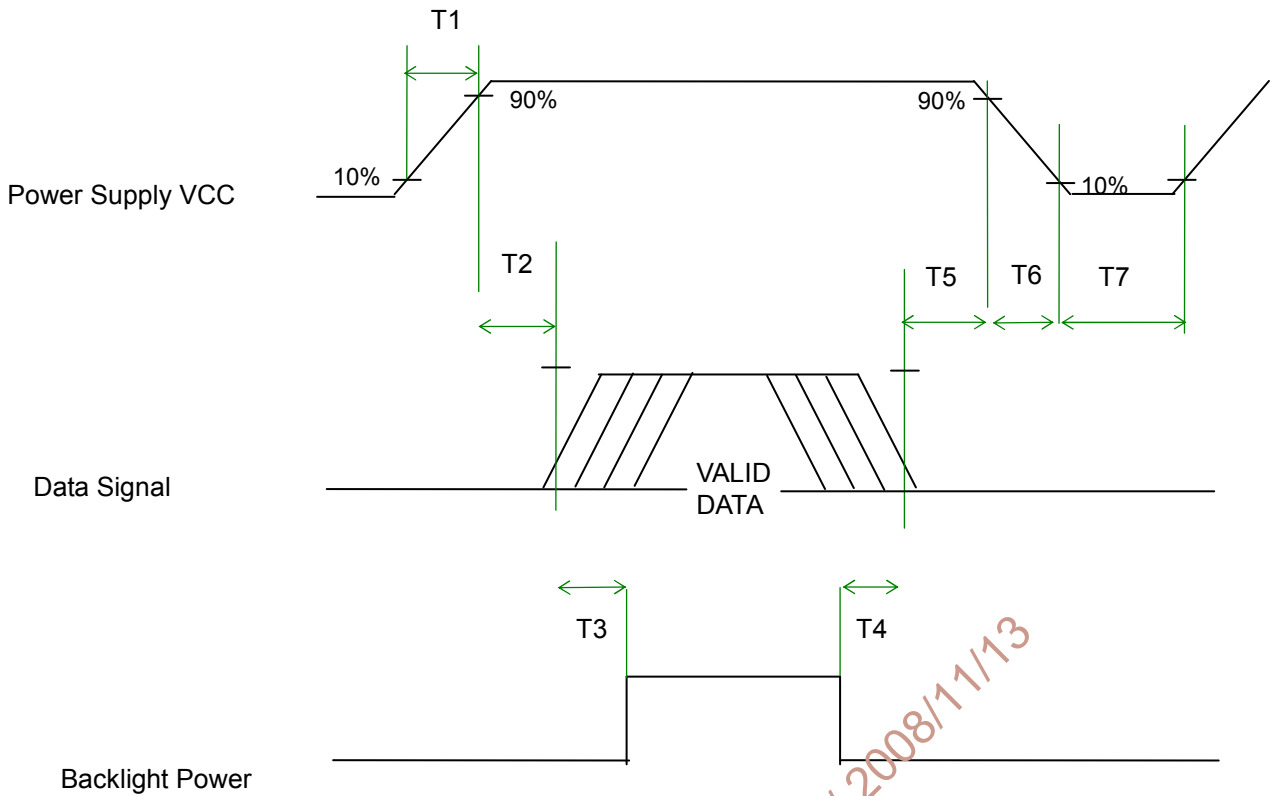
Vertical Input Timing

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Vsync Period (=TVD+TVBL)	TV	--	505	525	Th	
Active lines	TVD	--	480	--	Th	
Vertical blanking (=TVF+TVE)	TVBL	--	25	45	Th	
Vsync Front Porch	TVF	--	1	21	Th	
GD Start Pulse Delay	TVE	--	24	--	HS	
Vsync Pulse Width	TVW	--	3	16	Th	
Hsync/Vsync Phase Shift	TVPD	2	320	--	DCLK	

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### 6. Power On/Off Characteristics

Vcc power and LED on/off sequence is as follows. Interface signals are also shown in the chart. Signals from any system shall be Hi-Z state or low level when Vcc is off.



**Power Sequence Timing**

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0.5	-	10	[ms]
T2	30	40	50	[ms]
T3	200	-	-	[ms]
T4	100	-	-	[ms]
T5	0	16	50	[ms]
T6	-	-	10	[ms]
T7	1000	-	-	[ms]

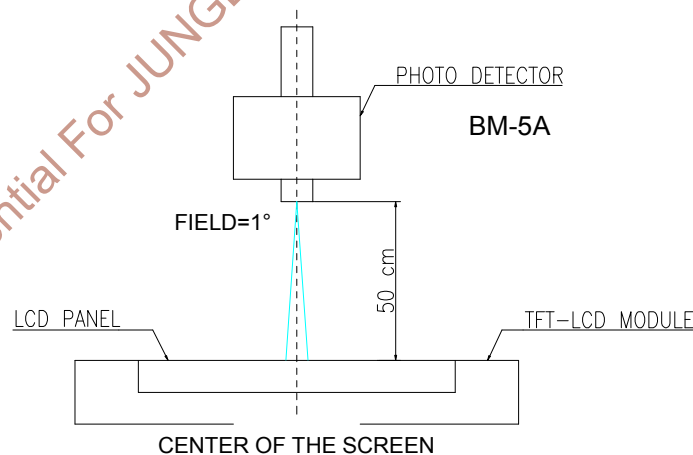
## D. Optical Specification

All optical specification is measured under typical condition (Note 1, 2)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time							
Rise	Tr	$\theta=0^\circ$	--	12	20	ms	Note 3
Fall	Tf	$\theta=0^\circ$	--	18	30	ms	
Contrast ratio	CR	At optimized viewing angle	400	500	--		Note 4
Viewing Angle	Top	$CR \geq 10$	35	45	--	deg.	Note 5
	Bottom		55	70	--		
	Left		55	70	--		
	Right		55	70	--		
Brightness	$Y_L$	$\theta=0^\circ$	300	375	--	$cd/m^2$	Note 6
Chromaticity	White	X	$\theta=0^\circ$	0.275	0.325	0.375	
		Y	$\theta=0^\circ$	0.290	0.340	0.390	
	Red	X	$\theta=0^\circ$	TBD	TBD	TBD	
		Y	$\theta=0^\circ$	TBD	TBD	TBD	
	Green	X	$\theta=0^\circ$	TBD	TBD	TBD	
		Y	$\theta=0^\circ$	TBD	TBD	TBD	
	Blue	X	$\theta=0^\circ$	TBD	TBD	TBD	
		Y	$\theta=0^\circ$	TBD	TBD	TBD	
Uniformity	$\Delta Y_L$	%	70	75	--	%	Note 7

Note 1: Ambient temperature =25°C, and LED lightbar voltage VL = 12 V. To be measured in the dark room.

Note 2: To be measured on the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-5A, after 15 minutes operation.

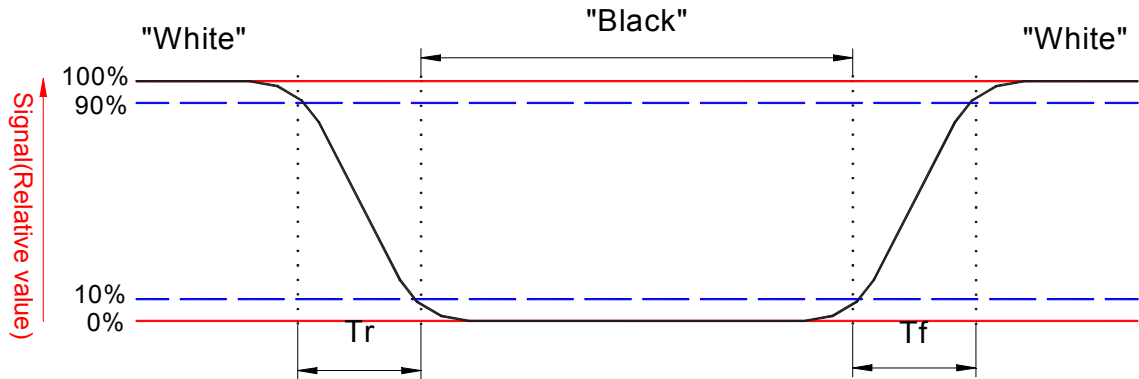




Note 3: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from "black" to "white"(falling time) and from "white" to "black"(rising time), respectively.

The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.

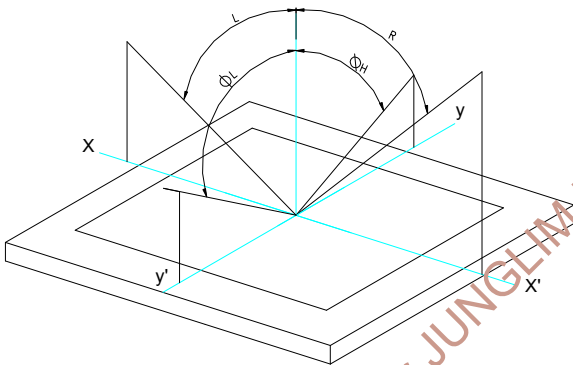


Note 4. Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

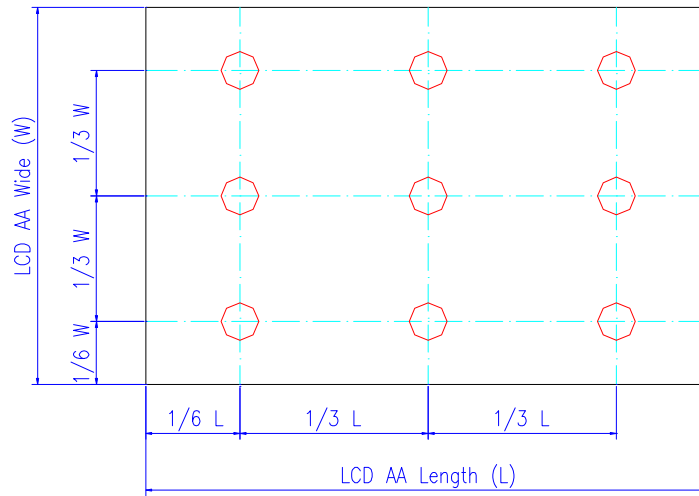
$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" status}}{\text{Photo detector output when LCD is at "Black" status}}$$

Note 5. Definition of viewing angle,  $\theta$ , Refer to figure as below.



Note 6. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 7: Luminance Uniformity of these 9 points is defined as below:



$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

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### E. Reliability Test Items

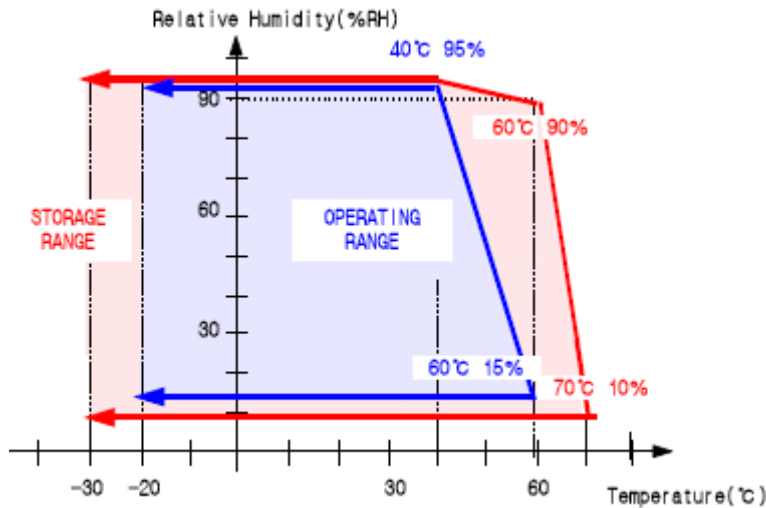
No.	Test items	Conditions	Remark
1	High Temperature Storage	Ta= 80°C      240Hrs	
2	Low Temperature Storage	Ta= -30°C      240Hrs	
3	High Ttemperature Operation	Tp= 70°C      240Hrs	
4	Low Temperature Operation	Ta= -20°C      240Hrs	
5	High Temperature & High Humidity	Tp= 50°C . 80% RH      240Hrs	Operation
6	Heat Shock	-20°C~70°C , 50 cycle, 2Hrs/cycle	Non-operation
7	Electrostatic Discharge	Contact = ± 4 kV, class B Air = ± 8 kV, class B	Note 5
8	Image Sticking	25°C , TBD	Note 6
9	Vibration	Frequency range : 10Hz~55Hz Stoke : 1.5mm Sweep : 10Hz~55Hz~10Hz 2 hours for each direction of X,Y,Z. Total 6 hours.	Non-operation JIS C7021, A-10 condition A
10	Mechanical Shock	100G . 6ms, ±X,±Y,±Z 3 times for each direction	Non-operation JIS C7021, A-7 condition C
11	Vibration (With Carton)	Random vibration: 0.015G /Hz from 5~200Hz -6dB/Octave from 200~500Hz	IEC 68-34
12	Drop (With Carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	
13	Pressure	5kg, 5sec	Note 7

Note 1: Ta: Ambient Temperature. Tp: Panel Surface Temperature

Note 2: In the standard conditions, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.

Note 3: All the cosmetic specification is judged before the reliability stress.

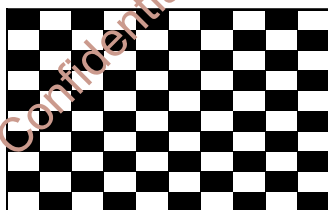
Note 4: temperature and relative umidity range is shown in the figure below



Note5 : All test techniques follow IEC6100-4-2 standard.

Test Condition		Note
Pattern		
Procedure And Set-up	<p>Contact Discharge : 330Ω, 150pF, 1sec, 8 point, 10times/point Air Discharge : 330Ω, 150pF, 1sec, 8 point, 10times/point</p>	
Criteria	B – Some performance degradation allowed. No data lost. Self-recoverable hardware failure.	

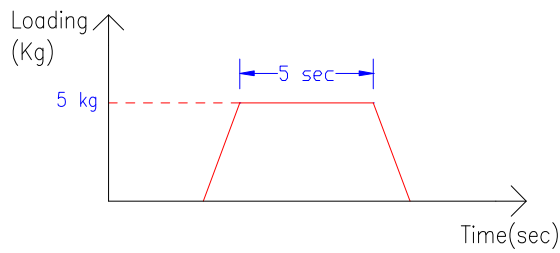
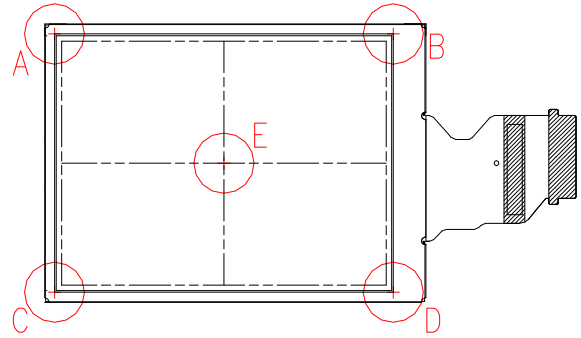
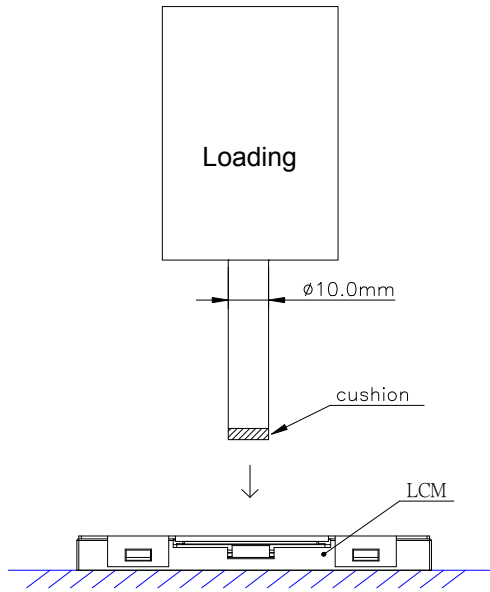
Note 6: Operate with chess board pattern as figure and lasting time and temperature as the conditions. Then judge with 50% gray level, the mura is not worse than AUO defined limited sample.



Note 7: The panel is tested as figure. The jig is  $\phi$  10 mm made by Cu with rubber and the loading speed is 3mm/min on position A~E. After the condition, no glass crack will be found and panel

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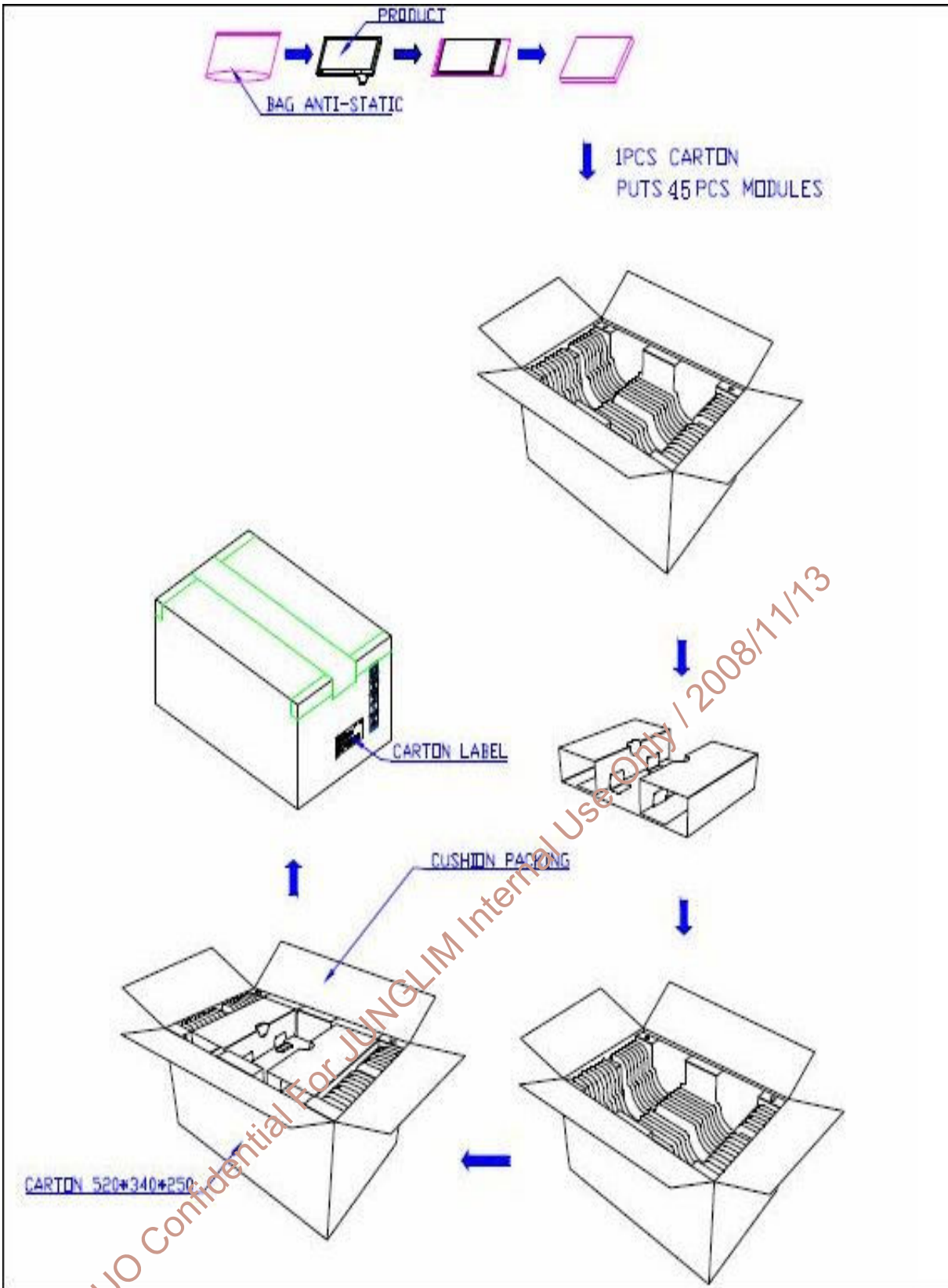
function check is OK.( no guarantee LC mura · LC bubble)



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## F. Packing and Marking

### 1. Packing Form



## 2. Module/Panel Label Information

The module/panel (collectively called as the "Product") will be attached with a label of Shipping Number which represents the identification of the Product at a specific location. Refer to the Product outline drawing for detailed location and size of the label. The label is composed of a 22-digit serial number with the following definition:

ABCDEFGHIJKLMNOPQRSTUV

- └─ For internal system usage and production serial numbers.
- └─ AUO Module or Panel factory code, represents the final production factory to complete the Product
- └─ Product version code, ranging from 0~9 or A~Z (for Version after 9)
- └─ Week Code, the production week when the product is finished at its production process

Example:

501M06ZL06123456781Z05:

Product Manufacturing Week Code: WK50

Product Version: Version 1

Product Manufacturing Factory: M06

## 3. Carton Label Information

The packing carton will be attached with a carton label where packing Qty, AUO Model Name, AUO Part Number, Customer Part Number (Optional) and a series of Carton Number in 13 or 14 digits are printed. The Carton Number is appearing in the following format:

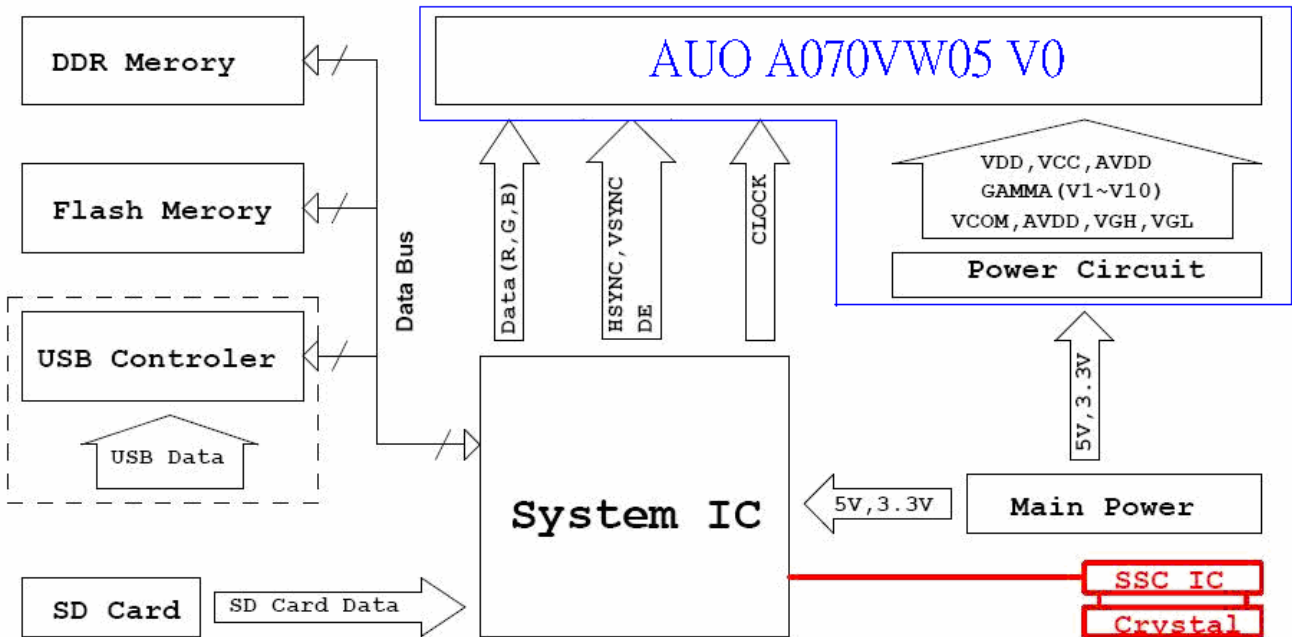
ABC-DEFG-HIJK-LMN

- └─ DEFG appear after first "-" represents the packing date of the carton
- └─ Date from 01 to 31
- └─ Month, ranging from 1~9, A~C. A for Oct, B for Nov and C for Dec.
- └─ A.D. year, ranging from 1~9 and 0. The single digit code represents the last number of the year

Refer to the drawing of packing format for the location and size of the carton label.

## G. Application Note

### 1. System block example



According to there are some risks of EMI issue.  
 Please refer to this function block before design.  
 If add SSC (Spread Spectrum Clocking) IC on the clock of system may cause  
 USB abnormal work. Please add USB controller to control USB data.

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## H. Precautions

1. Do not twist or bend the module and prevent the unsuitable external force for display module during assembly.
2. Adopt measures for good heat radiation. Be sure to use the module with in the specified temperature.
3. Avoid dust or oil mist during assembly.
4. Follow the correct power sequence while operating. Do not apply the invalid signal, otherwise, it will cause improper shut down and damage the module.
5. Less EMI: it will be more safety and less noise.
6. Please operate module in suitable temperature. The response time & brightness will drift by different temperature.
7. Avoid to display the fixed pattern (exclude the white pattern) in a long period, otherwise, it will cause image sticking.
8. Be sure to turn off the power when connecting or disconnecting the circuit.
9. Polarizer scratches easily, please handle it carefully.
10. Display surface never likes dirt or stains.
11. A dewdrop may lead to destruction. Please wipe off any moisture before using module.
12. Sudden temperature changes cause condensation, and it will cause polarizer damaged.
13. High temperature and humidity may degrade performance. Please do not expose the module to the direct sunlight and so on.
14. Acetic acid or chlorine compounds are not friends with TFT display module.
15. Static electricity will damage the module, please do not touch the module without any grounded device.
16. Do not disassemble and reassemble the module by self.
17. Be careful do not touch the rear side directly.
18. No strong vibration or shock. It will cause module broken.
19. Storage the modules in suitable environment with regular packing.
20. Be careful of injury from a broken display module.
21. Please avoid the pressure adding to the surface (front or rear side) of modules, because it will cause the display non-uniformity or other function issue.
22. Please use SSCG(Spread Spectrum Clock Generator) at system for EMI reduction.