AUO

CUSTOMER APPROVAL SHEET

Company Name	
MODEL	A070VW05 V2
CUSTOMER APPROVED	Title : Name :

☐ APPROVAL FOR SPECIFICATIONS ONLY (Spec. Ver. 0.2)

☐ APPROVAL FOR SPECIFICATIONS AND ES SAMPLE (Spec. Ver. 0.2)

☐ APPROVAL FOR SPECIFICATIONS AND CS SAMPLE (Spec. Ver. 0.2)

☐ CUSTOMER REMARK :

Product Specification

7.0" COLOR TFT-LCD MODULE/PANEL

Model Name :	**A070VW05 V2**

Planned Lifetime:	From 2008/Nov To 2010/Jul
Phase-out Control:	From 2010/Jan To 2010/Jul
EOL Schedule:	2010/Jul

< ◆ >Preliminary Specification

< >Final Specification

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

Record of Revision

| Version	Revise Date	Page	Content
0.0	2008/11/17		First Draft
0.1	2008/11/30	8	Correct VGL, VCOMin, and Gamma voltage setting.
0.2	2009/1/23	3	Update weight.
		4, 6	Correct BLU connector and recommended connector.
		9	Change driving condition VGL = -8V.
		11, 12	Update min/Max value of vertical and horizontal input timing.
		15	Update contrast and brightness spec.
		24	Add "Application Circuit".

Contents

A. General Information

A070VW05 V2 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), 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) × 5.1(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	155	
12	Power Consumption	W	1.8	Note 4
13	Viewing direction		6 o'clock (gray inversion)	

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

Note 2: Below figure shows dot stripe arrangement.

(1 2   3…………………………...2398 2399 2400)
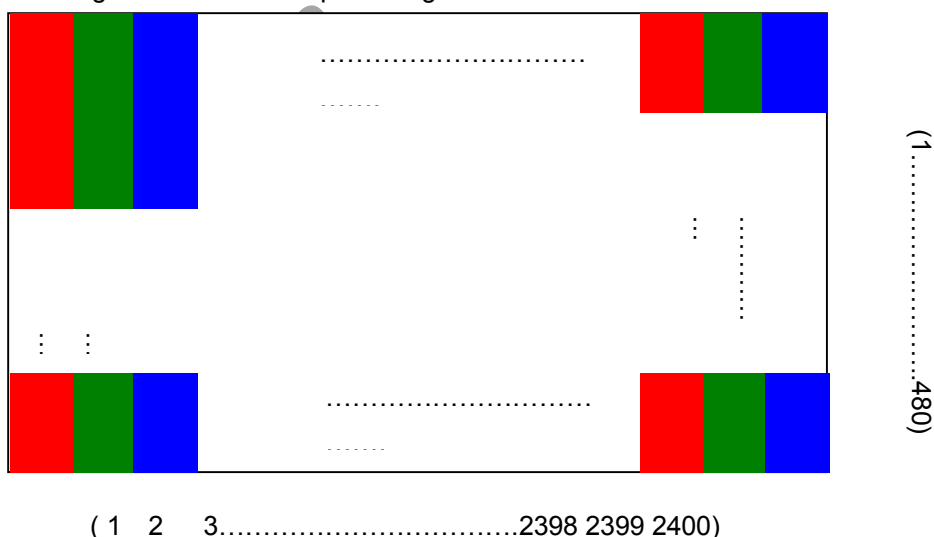
Note 3: The full color display depends on 24-bit data signal   (pin 5~28).

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

B. Outline Dimension

1. TFT-LCD Module

Notes:
1.General tolerance is ±0.3mm
2.The bending radius of FPC should be large than 0.6mm
3.BLU Connector: E&T H201K-P020N-02B
4.Contect Header Molex 53261-0290 compatible

-A-
3
4
5.1
(W/O Label)

165(OUTLINE)
154.4 (BEZEL OPENING)
152.4 (LCD ACTIVE AREA)
(80.2)

3.78
2.78
-B-

DISPLAY CENTER

(49.5)

91.44 (LCD ACTIVE AREA)
(BEZEL OPENING)
10 (OUTLINE)

60±5
PIN1(+)
(RED)
PIN2(−)
(BLACK)

40±0.5

(13.33)
121.37 ±1

(67.5)
(30)

16.9
12

Module Label

(85.1)

(12)
59.07A14.007
XXXXHXX

(128.1)
(30)

PIN50
PIN1

8±1

0.35±0.03
Pitch0.5±0.03
(50−1)*0.5=24.5±0.07
2−1±0.5
51

SEE DETAIL A

DETAIL A
SCALE 2/1

C. Electrical Specifications

1. TFT LCD Panel Pin Assignment

Recommended connector: HRS FH28-50S-0.5SH

Pin no	Symbol	I/O	Description	Remark
1	GND	P	Ground	
2	AVDD	P	Aanlog power supply voltage	
3	VDDIO	P	Digital power supply voltage	
4	GRB	I	Global Reset	
5	DR0	I	Red data input (LSB)	
6	DR1	I	Red data input	
7	DR2	I	Red data input	
8	DR3	I	Red data input	
9	DR4	I	Red data input	
10	DR5	I	Red data input	
11	DR6	I	Red data input	
12	DR7	I	Red data input (MSB)	
13	DG0	I	Green data input (LSB)	
14	DG1	I	Green data input	
15	DG2	I	Green data input	
16	DG3	I	Green data input	
17	DG4	I	Green data input	
18	DG5	I	Green data input	
19	DG6	I	Green data input	
20	DG7	I	Green data input (MSB)	
21	DB0	I	Blue data input (LSB)	
22	DB1	I	Blue data input	
23	DB2	I	Blue data input	
24	DB3	I	Blue data input	
25	DB4	I	Blue data input	
26	DB5	I	Blue data input	
27	DB6	I	Blue data input	
28	DB7	I	Blue data input (MSB)	
29	DCLK	I	Data clock input	
30	DE	I	Data enable Input	
31	HSYNC	I	Horizontal sync input	
32	VSYNC	I	Vertical sync input	
33	VDDIO	P	Digital power supply voltage	

34	GND	P	Ground	
35	AVDD	I	Analog power supply voltage	
36	VCOMin	I	Common electrode driving voltage	
37	V10	I	Gamma correction voltage reference	
38	V9	I	Gamma correction voltage reference	
39	V8	I	Gamma correction voltage reference	
40	V7	I	Gamma correction voltage reference	
41	V6	I	Gamma correction voltage reference	
42	V5	I	Gamma correction voltage reference	
43	V4	I	Gamma correction voltage reference	
44	V3	I	Gamma correction voltage reference	
45	V2	I	Gamma correction voltage reference	
46	V1	I	Gamma correction voltage reference	
47	VGH	P	Positive power supply voltage for Gate driver	
48	GVDDIO	P	Digital power supply voltage for Gate driver	
49	VGL	P	Negative power supply voltage for Gate driver	
50	GGND	P	Ground for Gate driver	

I: Input pin; P: Power pin;
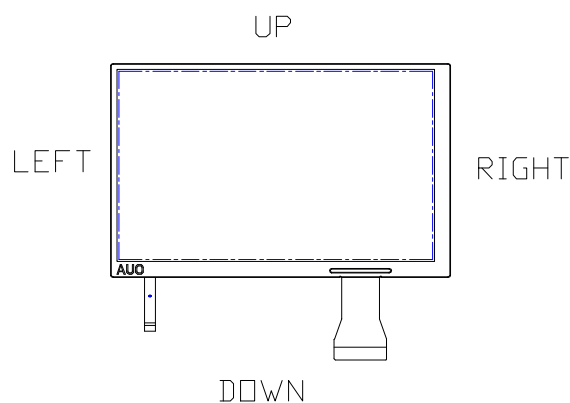
2. Backlight Pin Assignment

Recommended connector : Molex 53261-0290 compatible

Pin no	Symbol	I/O	Description	Remark
1	VLED+	P	Backlight LED anode	Red cable
2	VLED-	P	Backlight LED cathode	Black cable

3. Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power voltage	VDDIO	GND=0	-0.5	5.0	V	Digital power supply voltage
	AVDD	GND=0	-0.5	15	V	Aanlog power supply voltage
	GVDDIO	GGND=0	-0.5	6.0	V	Digital power supply voltage for Gate driver
	VGH	GGND=0	-0.3	40	V	Positive power supply voltage for Gate driver
	VGL	GGND=0	-20	0.3	V	Negative Positive power supply voltage for Gate driver
	VGH-VGL	GGND=0	-0.3	40	V	
Input signal voltage	Data	GND=0	-0.3	3.6	V	Digital Signals

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

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.

4. Electrical DC Characteristics

a. Typical Operation Condition (GND = GGND = 0V)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power Voltage		VDDIO	3.0	3.3	3.6	V	Digital power supply voltage
		AVDD	10.5	11	11.5	V	Aanlog power supply voltage
		GVDDIO	3.0	3.3	3.6	V	Digital power supply voltage for Gate driver
		VGH	17.5	18	18.5	V	Positive power supply voltage for Gate driver
		VGL	-8.5	-8.0	-7.5	V	Negative Positive power supply voltage for Gate driver
Input Signal Voltage	H Level	VIH	0.7xVDDIO	--	VDDIO	V	
	L Level	VIL	GND	--	0.3xVDDIO	V	
Gamma reference voltage		V1 ~ V5	AVDD/2	--	AVDD-1	V	Note1
		V6 ~ V10	1	--	AVDD/2	V	
VCOMin		VCDC	3.3	3.5	3.7	V	Note 2

Note 1: Recommended voltage setting for Gamma 2.2

Gamma 2.2		
	AVDD	11
00H	V1	10
10H	V2	8.45
20H	V3	7.95
30H	V4	7.53
3FH	V5	6.7
3FH	V6	4.3
30H	V7	3.47
20H	V8	3.05
10H	V9	2.55
00H	V10	1

Note2: Based on recommended Gamma 2.2 voltage.

b. Current Consumption (GND = GGND = 0V)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Input current for VDDIO	IVDDIO	VDDIO = 3.3V	--	15	20	mA	Note 1, 2
Input current for AVDD	IAVDD	AVDD = 11V	--	10	20	mA	Note 1, 2
Input current for GVDDIO	IGVDDIO	GVDDIO = 3.3V	--	0.08	0.15	mA	Note 1, 2
Input current for VGH	VGH	VGH = 18V	-	0.35	0.5	mA	Note 1, 2
Input current for VGL	VGL	VGL = -8V	-0.5	-0.35	-	mA	Note 1, 2

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

Note 2: Test pattern is the following picture.

c. Backlight Driving Conditions

The backlight (LED module, Note 1) is suggested to drive by constant current with typical value.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Current	I_L	--	180	225	mA	Note 1
Power Consumption	V_L	8.4	9.9	10.8	V	
LED Life Time	L_L	10,000	--	--	Hr	Note 2, 3

Note 1: LED backlight is nine parallel strings and three LEDs for each string is as below figure. Suggest to drive by 180mA for LED lightbar.
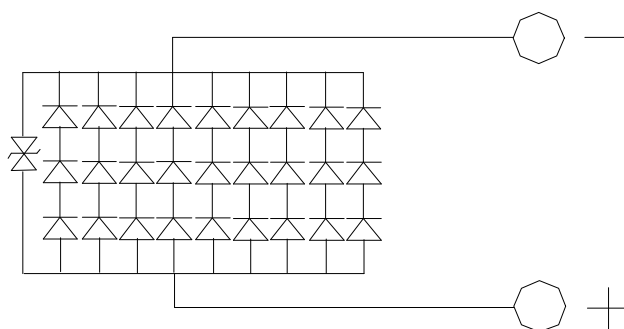
Note 2: Define "LED Lifetime": brightness is decreased to 50% of the initial value. LED Lifetime is restricted under normal condition, ambient temperature = 25℃ and LED lightbar current = 180mA.

Note 3: If it uses larger LED lightbar voltage/ current more than 180mA, it maybe decreases the LED lifetime.

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} x100%
VSYNC setup time	t_{vst}	0	--	--	ns	
VSYNC hold time	t_{vhd}	2	--	--	ns	
HSYNC setup time	t_{hst}	5	--	--	ns	
HSYNC hold time	t_{hhd}	10	--	--	ns	
Data Enable setup time	t_{dst}	4			ns	
Data Enable hold time	T_{dhd}	2			ns	
Data setup time	t_{dst}	5	--	--	ns	
Data hold time	t_{dhd}	10	--	--	ns	
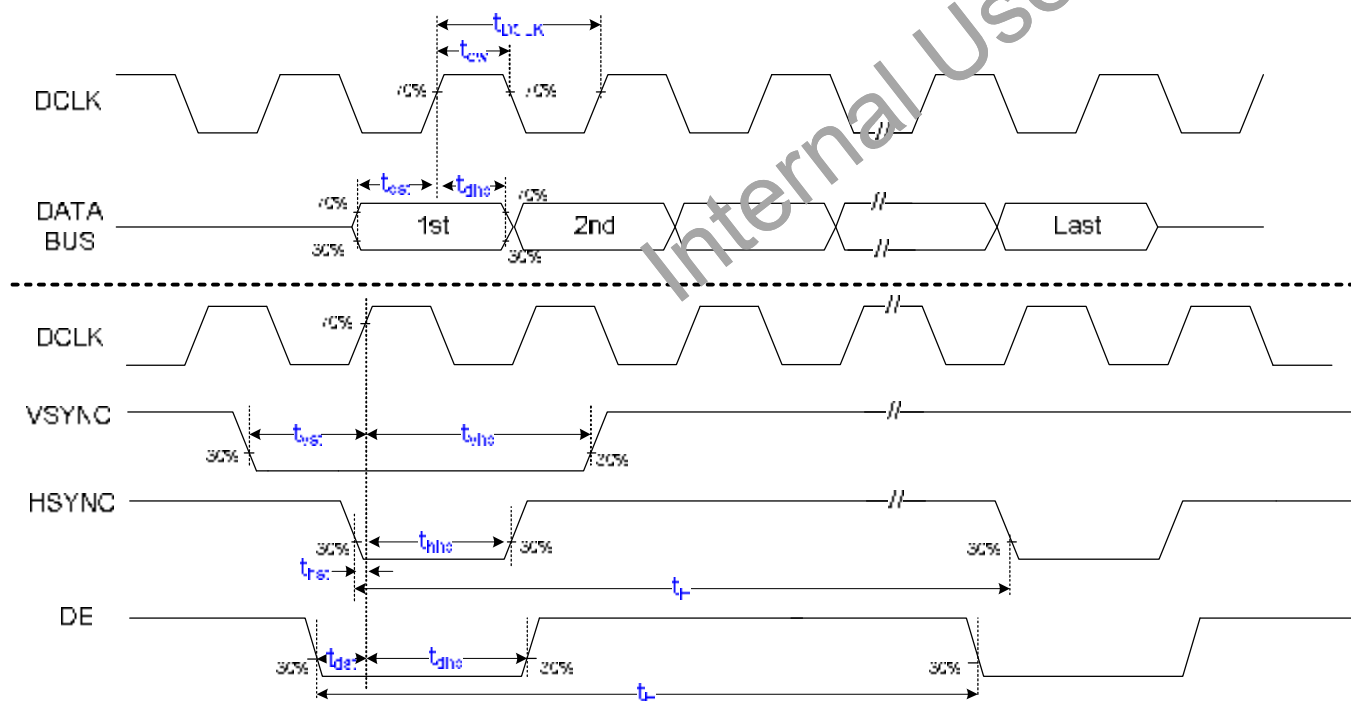
t_H: HSYNC period

t_{DCLK}: DCLK period

t_{cw}: the width of DCLK high

b. Input Timing
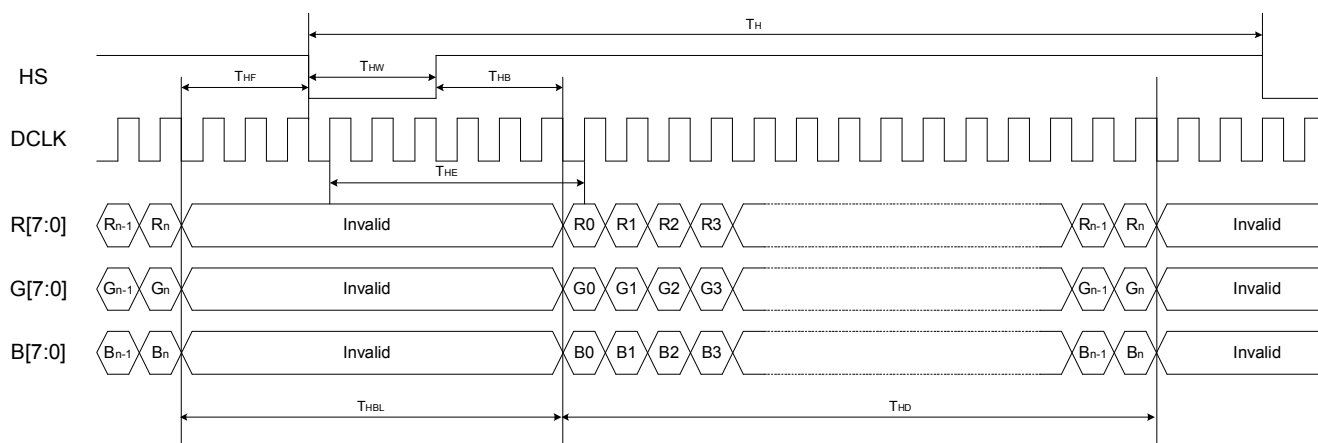
Horizontal input timing. (HV mode)
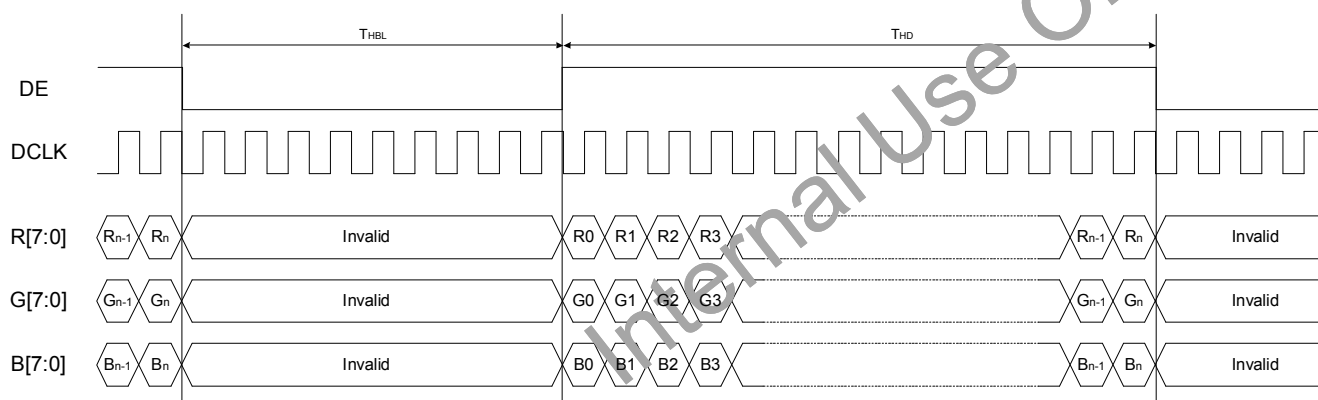
Horizontal input timing. (DE mode)

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	889	1056	1183	DCLK	
Active Area	THD	--	800	--	DCLK	
Horizontal Blanking	THBL	89	256	383	DCLK	
Hsync Front Porch	THF	1	40	--	DCLK	
Delay from Hsync to 1st data	THE	88	216	343	DCLK	
Hsync Pulse Width	THW	1	128	136	DCLK	
Hsync Back Porch	THB	$T_{HE}-T_{HW}$	88	$T_{HE}-T_{HW}$	DCLK	
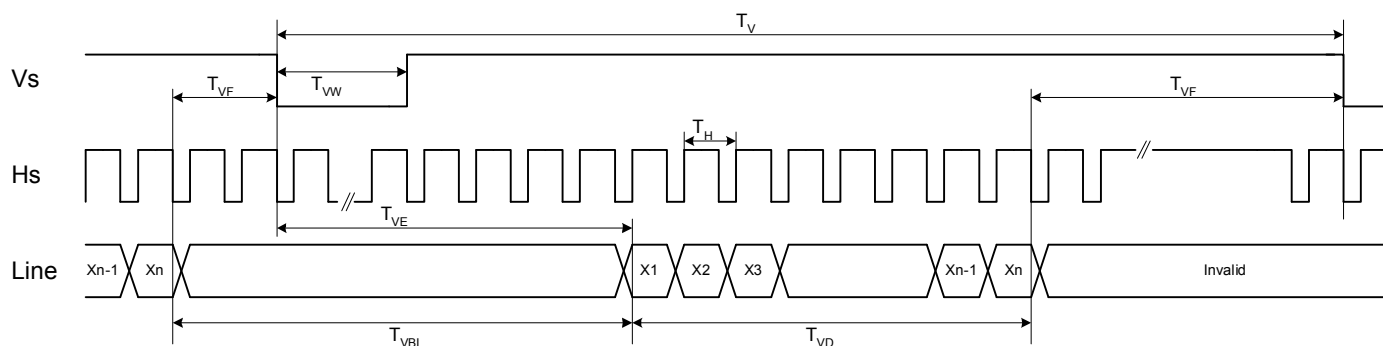
Vertical timing. (HV mode)
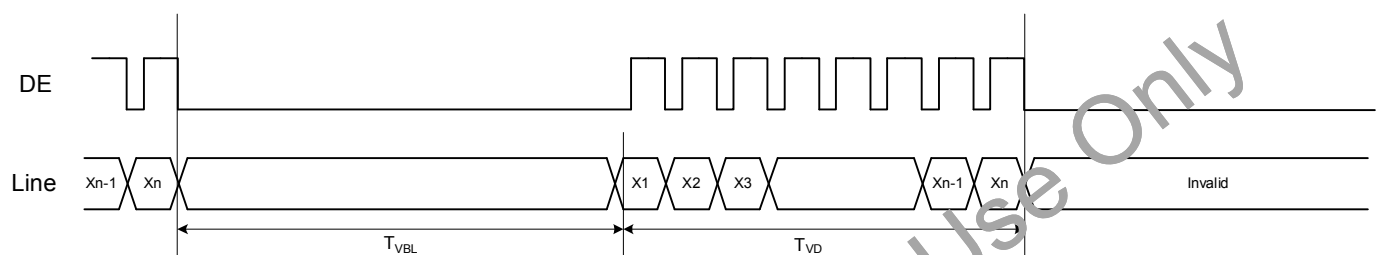
Vertical timing. (DE mode)

Vertical Input Timing

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Vsync Period (=TVD+TVBL)	TV	497	505	512	Th	
Active lines	TVD	--	480	--	Th	
Vertical blanking (=TVF+TVE)	TVBL	17	25	32	Th	
Vsync Front Porch	TVF	--	1	--	Th	
GD Start Pulse Delay	TVE	16	24	31	HS	
Vsync Pulse Width	TVW	1	3	16	Th	
Hsync/Vsync Phase Shift	TVPD	2	320	--	DCLK	

6. Power On/Off Characteristics

Panel 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 VDDIO is off.

Power-off   Power-on

> 1000ms

VDDIO

VDDIO

GND
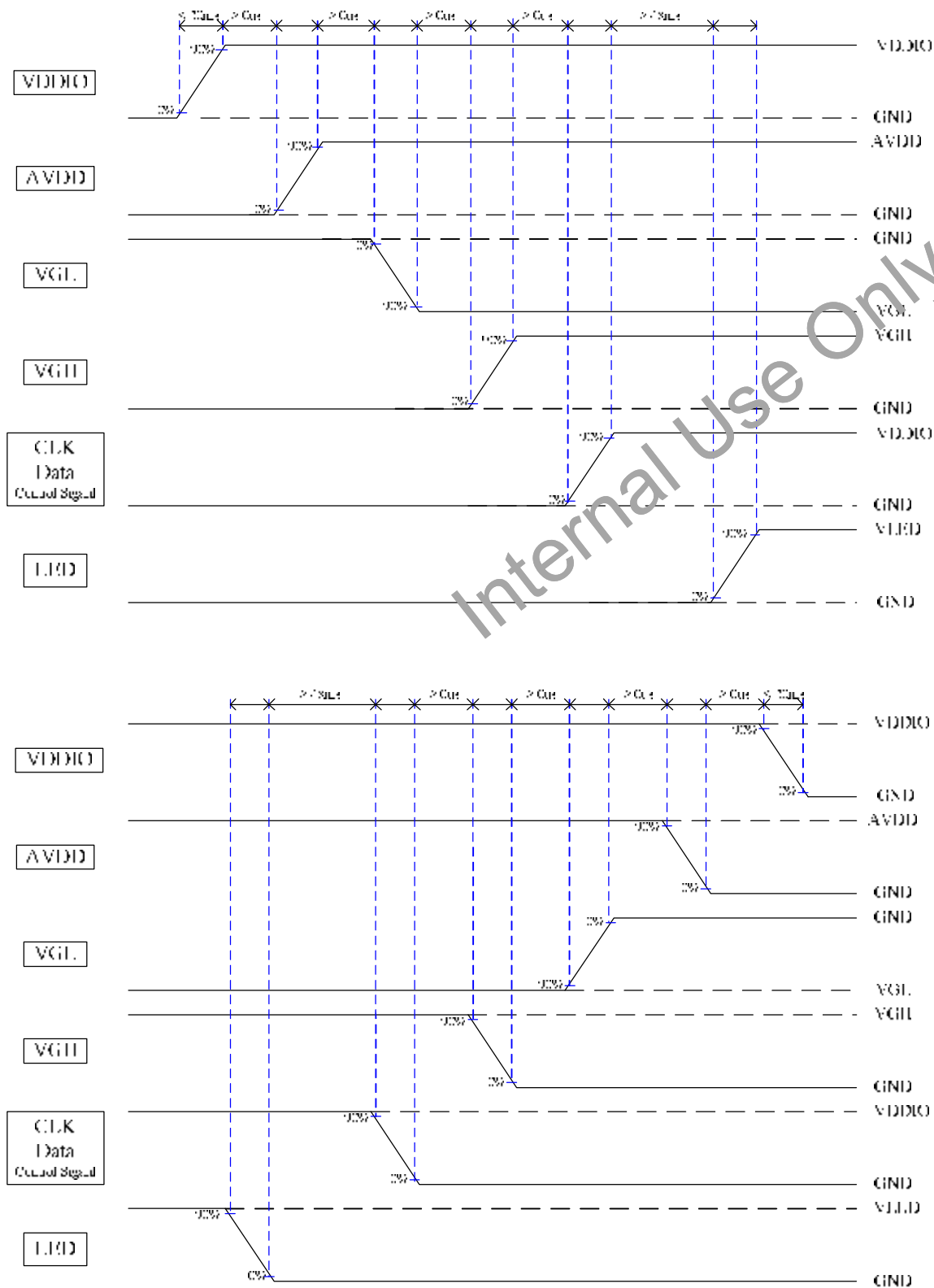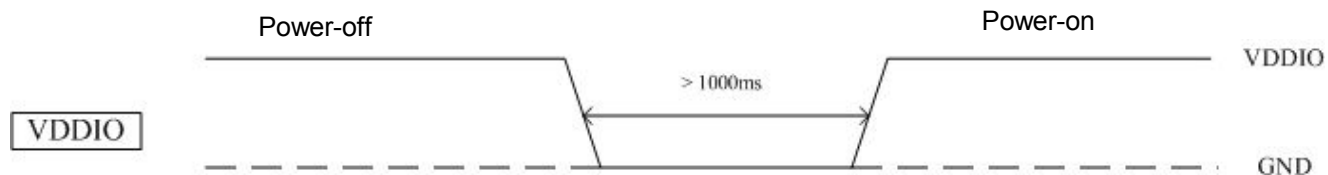
D. Optical Specification

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

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time Rise		Tr	θ=0°	--	12	20	ms	Note 3
Fall		Tf		--	18	30	ms	
Contrast ratio		CR	At optimized viewing angle	350	500	--		Note 4
Viewing Angle	Top		CR≧10	35	45	--	deg.	Note 5
	Bottom			55	65	--		
	Left			55	65	--		
	Right			55	65	--		
Brightness		Y_L	θ=0°	300	375	--	cd/m²	Note 6
Chromaticity	White	X	θ=0°	TBD	TBD	TBD		
		Y	θ=0°	TBD	TBD	TBD		
	Red	X	θ=0°	TBD	TBD	TBD		
		Y	θ=0°	TBD	TBD	TBD		
	Green	X	θ=0°	TBD	TBD	TBD		
		Y	θ=0°	TBD	TBD	TBD		
	Blue	X	θ=0°	TBD	TBD	TBD		
		Y	θ=0°	TBD	TBD	TBD		
Uniformity		$\triangle Y_L$	%	70	75	--	%	Note 7

Note 1: Ambient temperature =25℃, 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.
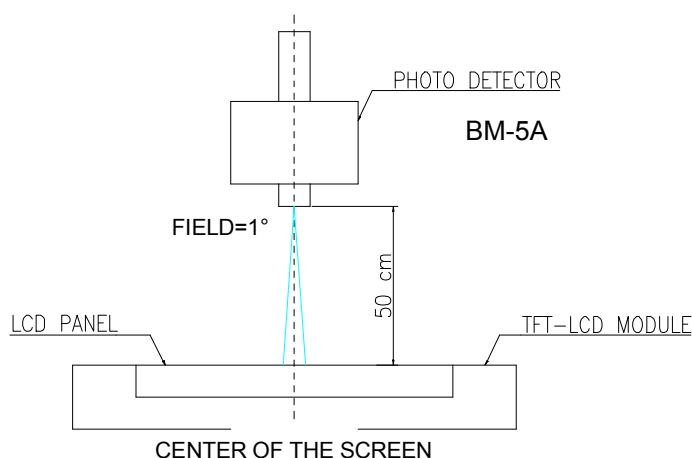
Note 3: Definition of response time:

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.
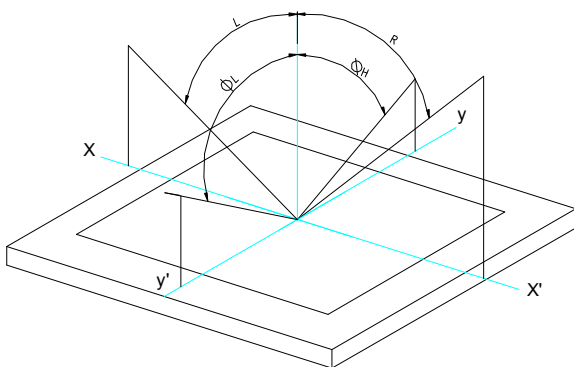
Refer to figure as below.
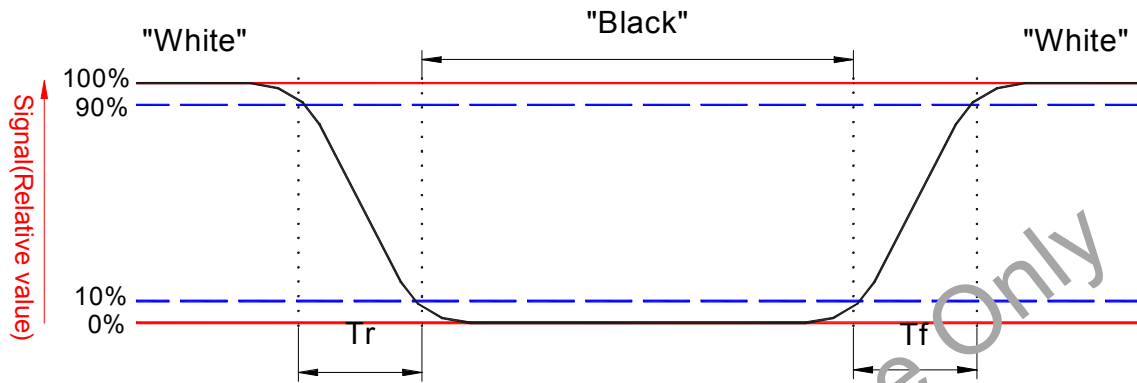
Note 4. Definition of contrast ratio:

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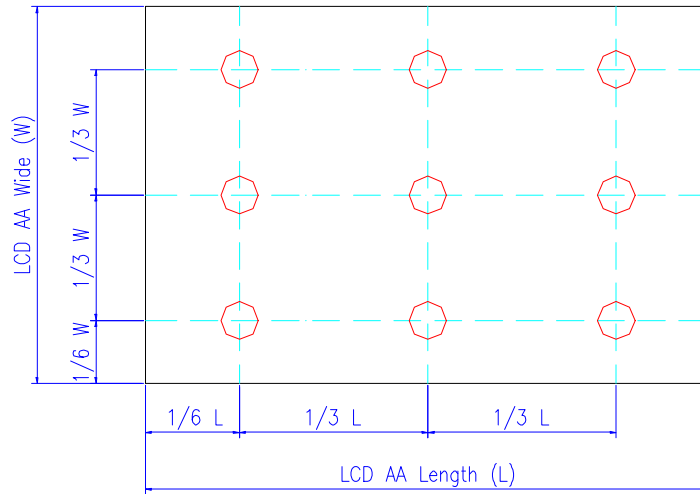
$$Uniformity = \frac{minimum\ luminance\ in\ 9\ points\ (1\text{-}9)}{maximum\ luminance\ in\ 9\ points\ (1\text{-}9)}$$

E. Reliability Test Items

No.	Test items	Conditions	Remark
1	High Temperature Storage	Ta= 80℃　　　240Hrs	
2	Low Temperature Storage	Ta= -30℃　　　240Hrs	
3	High Ttemperature Operation	Tp= 70℃　　　240Hrs	
4	Low Temperature Operation	Ta= -20℃　　　240Hrs	
5	High Temperature & High Humidity	Tp= 50℃. 80% RH　　　240Hrs	Operation
6	Heat Shock	-20℃~70℃, 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℃, 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^2/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

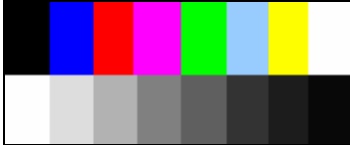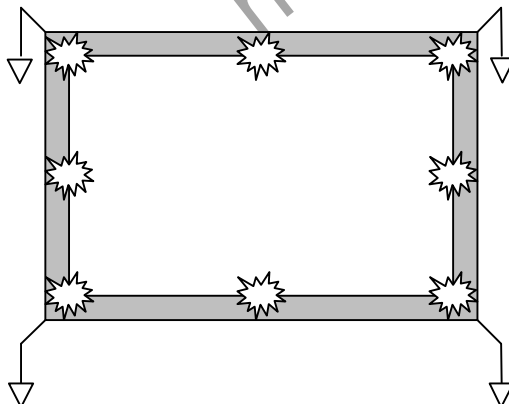Note 1: Ta: Ambient Temperature. Tp: Panel Surface Temperature

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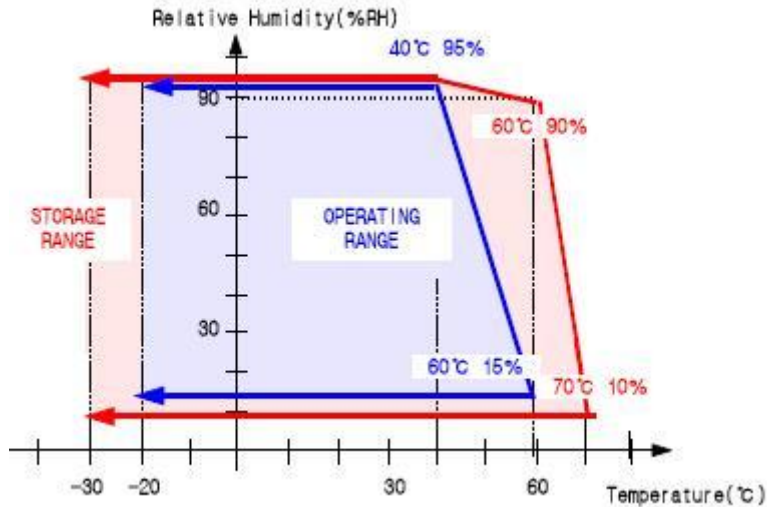
Note5 : All test techniques follow IEC6100-4-2 standard.

Test Condition		Note
Pattern		
Procedure And Set-up	Contact Discharge：330Ω, 150pF, 1sec, 8 point, 10times/point Air Discharge：330Ω, 150pF, 1sec, 8 point, 10times/point 	
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.

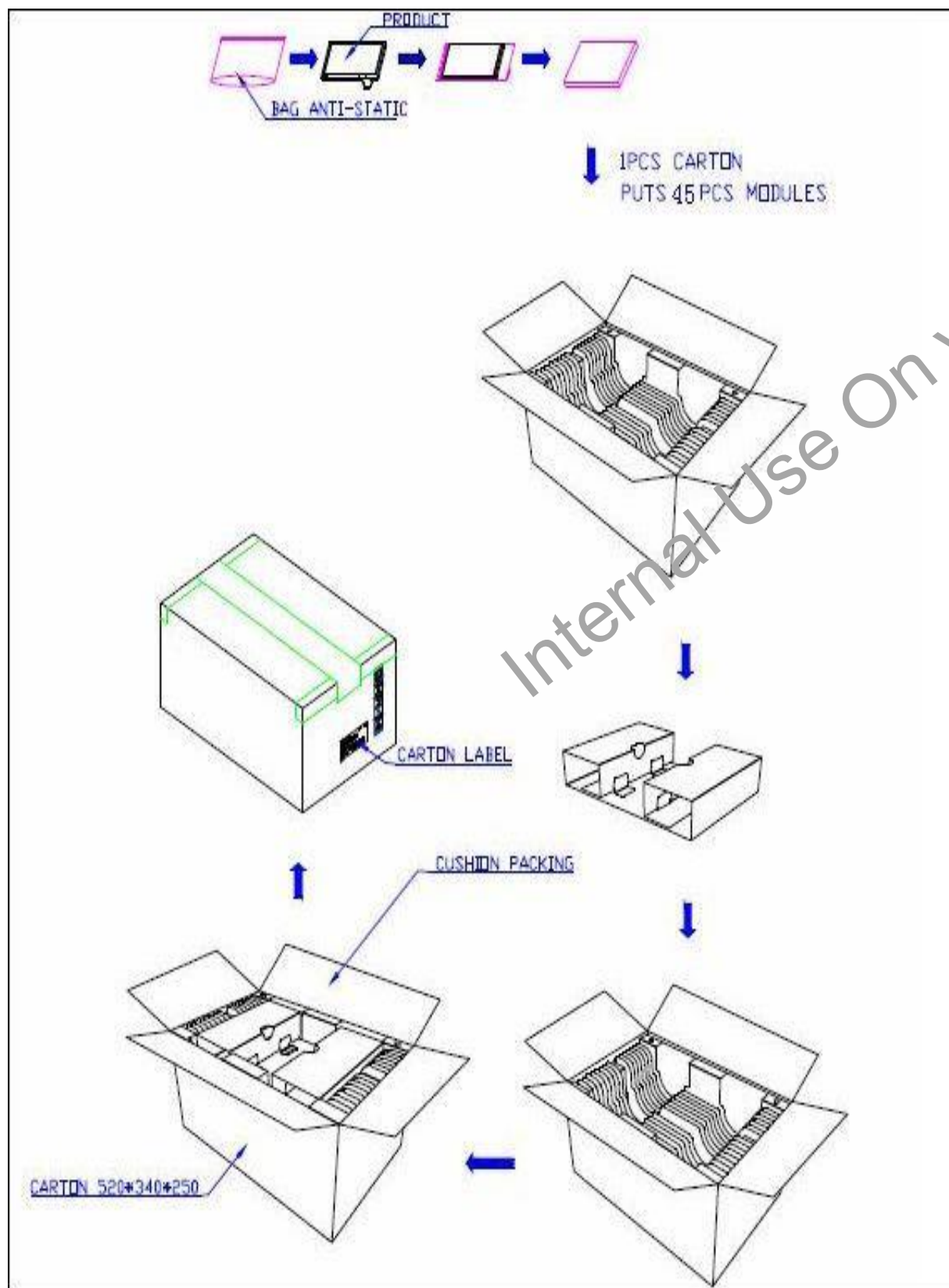Then judge with 50% gray level, the mura is not worse than AUO defined limited sample.
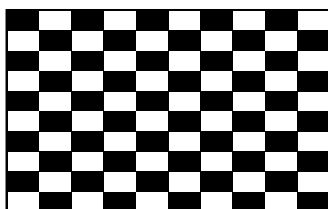
Note 7: The panel is tested as figure. The jig is ϕ 10 mm   made by Cu with rubber and the loading

speed is 3mm/min on position A~E. After the condition, no glass crack will be found and panel

function check is OK.(no guarantee LC mura、LC bubble)
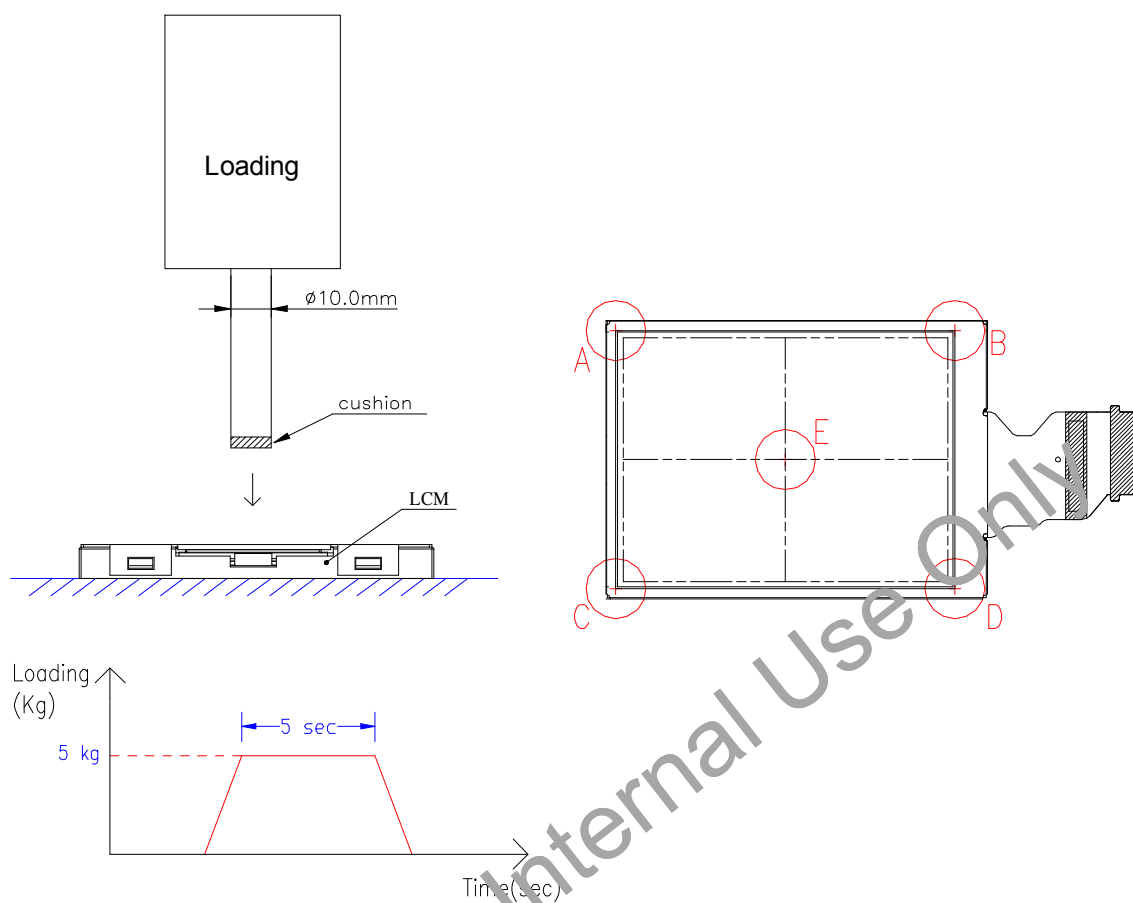
F. Packing and Marking

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 Manufactuing Factory: M06

3. Carton Label Information

The packing carton will be attached with a carton label where packing Q'ty, 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 apparing 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 reprents the last number of the year
```

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

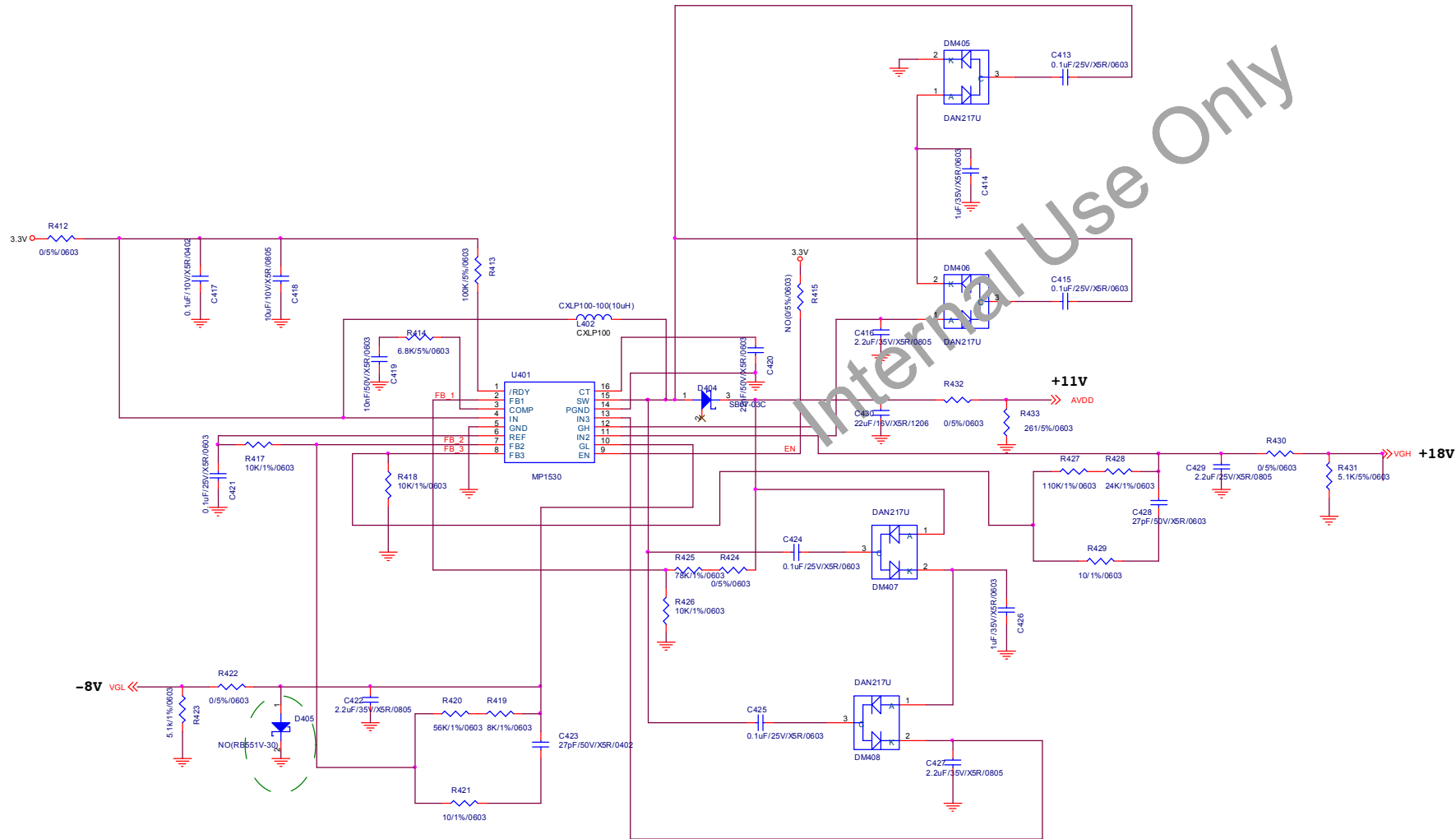## G. Application Note

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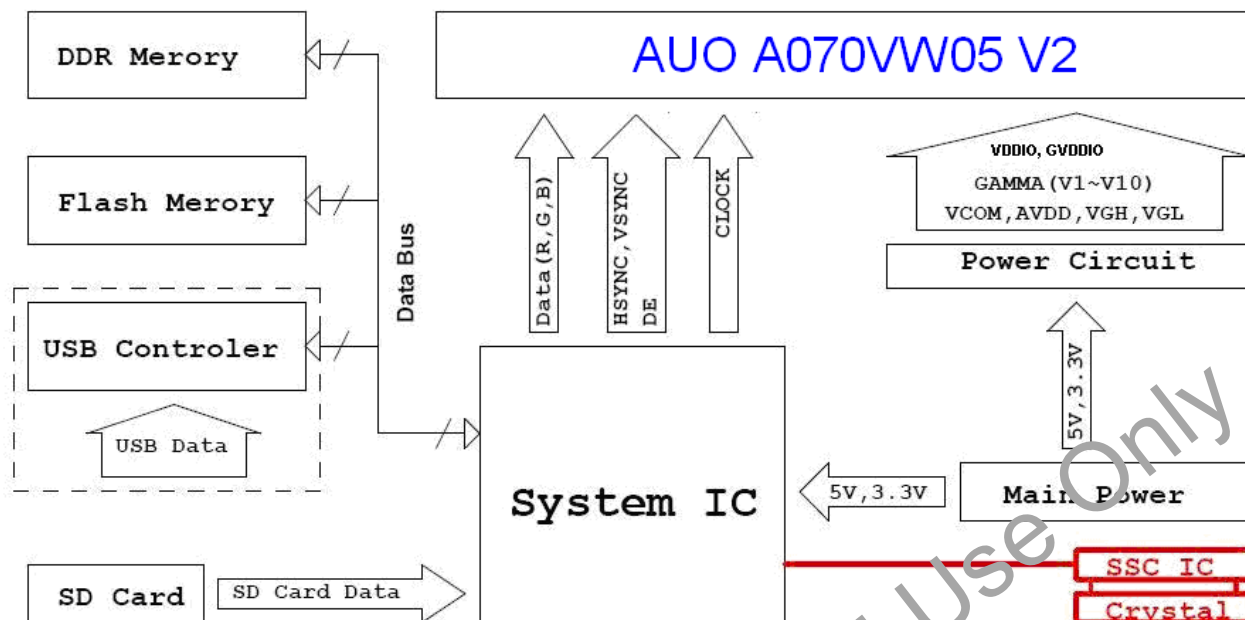
According to there are some risks of EMI issue.
Please refer to this function block before design.
If add SSC (Spread Spectrum Clocking) IC on the clock of system may cause
USB abnormal work. Please add USB controller to control USB data.

2. Application Circuit

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.