AUO

CUSTOMER APPROVAL SHEET

Company Name	
MODEL	C070VW04 V1
CUSTOMER APPROVED	Title : Name :

☐ **APPROVAL FOR SPECIFICATIONS ONLY (Spec. Ver. 0.8)**

☐ **APPROVAL FOR SPECIFICATIONS AND ES SAMPLE (Spec. Ver.0.8)**

☐ **APPROVAL FOR SPECIFICATIONS AND CS SAMPLE (Spec. Ver.0.8)**

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Doc. Version	0.8
Total Page	19
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Product Specification

7" COLOR TFT-LCD MODULE

Model Name :   **C070VW04 V1**

Planned Lifetime: From 2009/Apr To 2016/Apr
Phase-out Control: TBD
EOL Schedule: TBD

<   >Preliminary Specification

< ◆ >Final Specification

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

Record of Revision

Version	Revise Date	Page	Content
0.0	2009/4/09		First draft.
0.1	2009/04/16	6	Mechanical Drawing → Page 6
		8	LED Maximum Rating
		8	BL Driving Condition
0.2	2009/07/22	6	Outline Dimension Drawing update
		16	Packing Form Updates
0.3	2009/09/07	6	Mechanical Drawing update
		13	Definition of Rising and Falling response time
0.4	2009/12/30	6	Outline Dimension drawing update
		9	Power On/Off sequence update, Define DEN signal.
		14	Update Note.10 Luminance uniformity definition
		16	Update Packing form drawing
0.5	2010/01/22	8	Modify vertical cycle minimum value
		13	Add Luminance, Contrast, Res onse time, Viewing angle Max or min value
		5	Update module weight
		7	Correct PIN6 Description
0.6	2010/02/24	12	Update Timing Diagram (HV Mode)
0.7	2010/08/06	6	Update Mechanical Drawing(Customer asked to change the length of power cord from 85 to 90mm).
		13	Update response time and definition of response time
		17	Update Packing Form and Marking
0.8	2011/05/04	15	Update Reliability Test Items

Contents

A. General Description

C070VW04 V1 is an a-Si type Thin Film Transistor Liquid crystal Display (TFT-LCD) with AMVA-Mobile (Advanced MVA) technology. This model is composed of a TFT-LCD, a driver, an FPC (flexible printed circuit), and a backlight unit . TCON (timing controller) is also embedded in source driver.

B. Features

- 7-inch (15:9) display
- 800RGB x 480 resolution in RGB stripe dot arrangement
- High brightness
- Interfaces: parallel RGB 18-bit
- Advanced MVA -- wide view technology
- RoHs compliance

C. Physical Specifications

NO.	Item	Unit	Specification	Remark
1	Display Resolution	dot	800 RGB (H)×480(V)	
2	Active Area	mm	152.4(H)×91.44(V)	
3	Screen Size	inch	7(Diagonal)	
4	Dot Pitch	mm	0.0635(H)×RGBx0.1905(V)	
5	Color Configuration	--	R. G. B. Stripe	Note 1
6	Color Depth	--	262K Colors	
7	Overall Dimension	mm	164.55(H) × 105.01(V) × 6.67(T)	Note 2
8	Weight	g	145	
9	Display Mode	--	Normally Black	
10	Surface Treatment		AG	

Note 1: Below figure shows dot stripe arrangement.
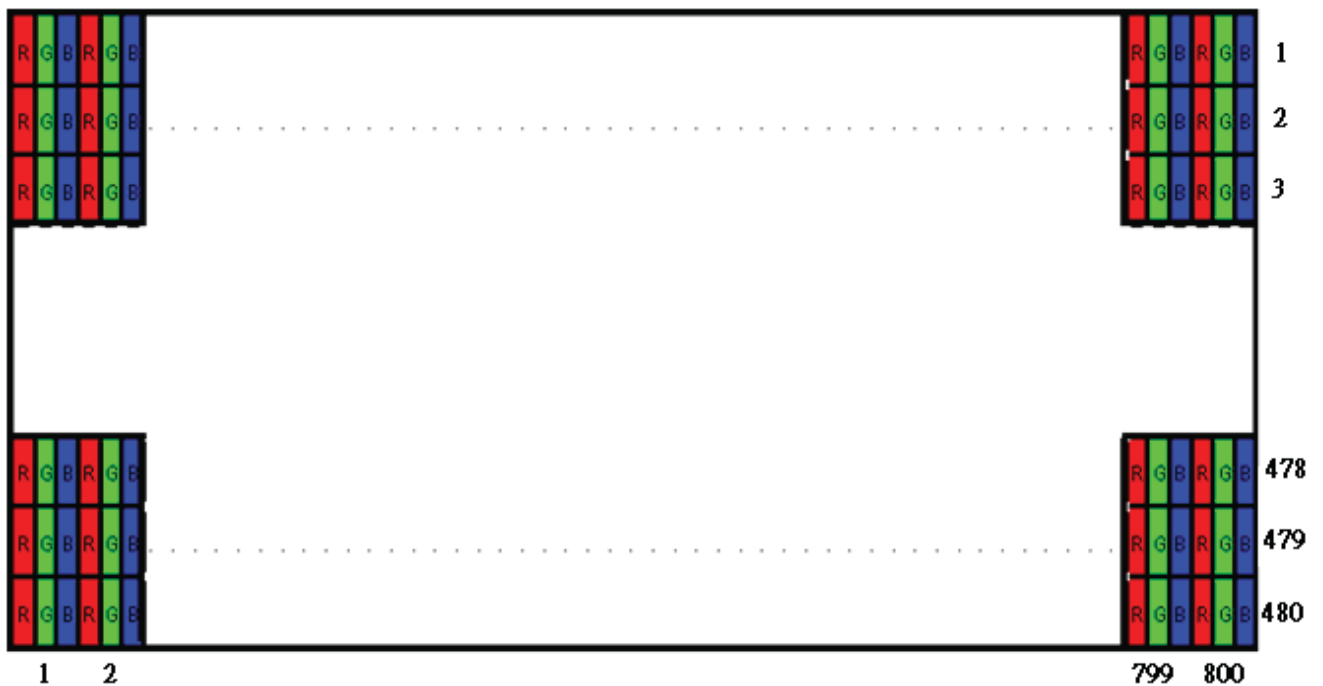
Note 2: Not including FPC. Please refer to the drawing in page 6 for further information.

D. Outline Dimension –
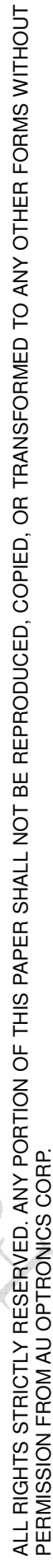
E. Electrical Specifications

1. Pin Assignment

Connector=HRS FH28D-50S-0.5SH(05)

No.	Pin Name	I/O	Description	Remarks
1	VCOM	PI	Common electrode driving voltage	
2	VGH	PI	Positive power supply voltage for TFT	
3	VGL	PI	Negative power supply voltage for TFT	
4	VDD	PI	Digital power supply voltage.	
5	GND	G	Ground	
6	V1	I	Gamma correction voltage	
7	V2	I	Gamma correction voltage	
8	V3	I	Gamma correction voltage	
9	V4	I	Gamma correction voltage	
10	V5	I	Gamma correction voltage	
11	V6	I	Gamma correction voltage	
12	V7	I	Gamma correction voltage	
13	V8	I	Gamma correction voltage	
14	V9	I	Gamma correction voltage	
15	V10	I	Gamma correction voltage	
16	V11	I	Gamma correction voltage	
17	V12	I	Gamma correction voltage	
18	V13	I	Gamma correction voltage	
19	V14	I	Gamma correction voltage	
20	AVDD	PI	Analog power supply voltage	
21	AVDD	PI	Analog power supply voltage	
22	GND	G	Ground	
23	VS	I	Vertical Sync input	
24	HS	I	Horizontal Sync input	
25	DE	I	Data Enable Input (High Active)	
26	DCLK	I	Data clock Input	
27	GND	G	Ground	
28	DB5	I	Blue data input(MSB)	
29	DB4	I	Blue data input	
30	DB3	I	Blue data input	
31	DB2	I	Blue data input	
32	DB1	I	Blue data input	
33	DB0	I	Blue data input(LSB)	
34	DG5	I	Green data input (MSB)	
35	DG4	I	Green data Input	
36	DG3	I	Green data Input	
37	DG2	I	Green data Input	
38	DG1	I	Green data Input	
39	DG0	I	Green data Input (LSB)	
40	DR5	I	Red data input (MSB)	
41	DR4	I	Red data input	
42	DR3	I	Red data Input	
43	DR2	I	Red data Input	
44	DR1	I	Red data Input	
45	DR0	I	Red data Input (LSB)	
46	Mode	I	DE/SYNC mode selection. "H" for DE mode. "L" for HV mode.	
47	STBYB	I	Standby mode. "H" for normal operation. "L" for standby mode.	
48	RSTB	I	Global reset pin. (low active)	
49	GND	G	Ground	
50	V-COM	PI	Common electrode driving voltage	

I: Digital signal input, O: Digital signal output, G: GND, PI: Power input

2. Absolute Maximum Ratings

Items	Symbol	Values		Unit	Condition
		Min.	Max.		
Power Voltage	VDD	-0.3	4.5	V	
	AVDD	-0.5	13.5	V	
	VGH	-0.3	20	V	
	VGL	-15	0.3	V	
	VGH-VGL	0	35	V	
Input Signal Voltage	Vi	-0.3	Vdd+ 0.3	V	
	Vref(V1~V7)	0.4AVDD	AVDD-0.3	V	
	Vref(V8~V14)	0.1	0.6AVDD	V	
	VCOM	-0.3	10	V	
Operation Temperature	Topa	-30	+85	℃	Ambient
Storage Temperature	Tstg	-40	+95	℃	Ambient
LED	Vf	-0.5	16	V	
	If	0	90	mA	

Note 1: Functional operation should be restricted under normal ambient temperature.

3. Electrical Characteristics
The following items are measured under stable condition and suggested application circuit.

a. TFT- LCD Panel

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Power Supply	VDD	3.1	3.3	3.5	V	
	AVDD	12.2	12.5	12.8	V	
	VGH	14.5	15	15.5	V	
	VGL	-9.5	-9	-8.5	V	
	VCOM	5.11	5.31	5.51	V	
Input Signal Voltage	Vi	-0.3	-	Vdd+ 0.3	V	
	Vref(V1~V7)	0.4AVdd	-	AVdd-0.3	V	
	Vref(V8~V14)	0.1	-	0.6AVdd	V	
Input high voltage	Vh	0.7Vdd	-	Vdd	V	
Input low voltage	Vl	0	-	0.3Vdd		
Vertical cycle	f_V	50	60	80	Hz	
Horizontal cycle	f_H	28.9	31.5	42	kHz	
Dot Frequency	f_{DCLK}		33.3	45	MHz	

b. Recommend Gamma Voltage

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Gamma Voltage	V1	-	12.24	-	V	
	V2	-	11.62	-	V	
	V3	-	10.40	-	V	
	V4	-	9.78	-	V	
	V5	-	9.38	-	V	
	V6	-	8.46	-	V	
	V7	-	6.83	-	V	
	V8	-	6.40	-	V	
	V9	-	4.58	-	V	
	V10	-	3.74	-	V	
	V11	-	3.27	-	V	

	V12	-	2.60	-	V	
	V13	-	1.18	-	V	
	V14	-	0.28	-	V	

c. Backlight Driving Conditions (Note 1)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Supply Current	I_L	-	80	90	mA	single serial
LED Supply Voltage	V_L	-	14	16	V	Note 3
LED Life Time	L_L	10000	---	---	Hr	Note 2

Note 1: LED backlight is 12 LEDs (3 strings, 4pcs for each string).
Note 2: The LED lifetime 10000hrs means , after normal use at 80mA, room temperature +25
         the brightness decreases to 50% of original level.
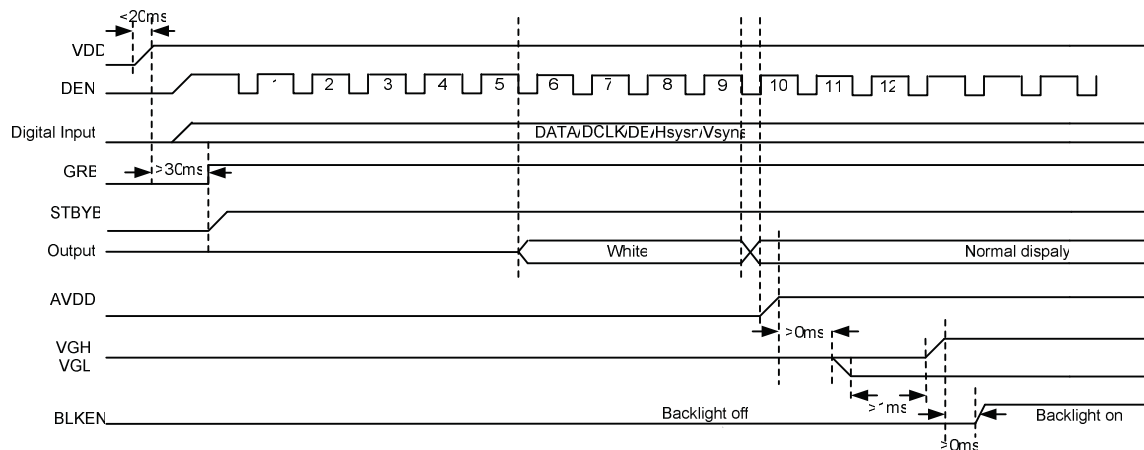Note 3: The LED supply power is for 3 string of LED

4. AC Timing

a. Power on/off sequence

The LCD adopts high voltage driver IC, so it could be permanently damaged under a wrong power on/off sequence. The suggested LCD power sequence is below:
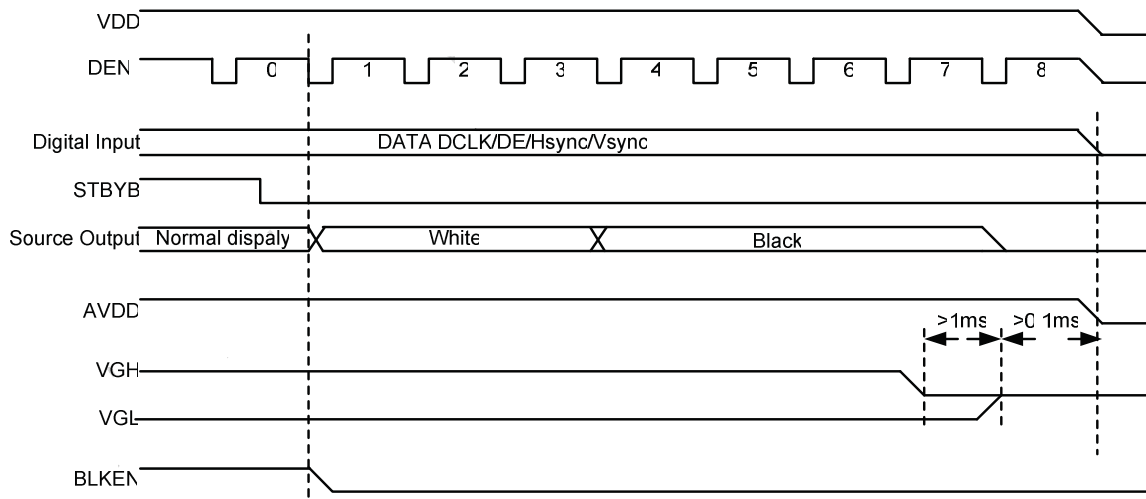
Power on sequence:

VDD -> GRB -> STBYB -> Digital input (Data/DCLK/DE) -> AVDD -> VGL -> VGH -> BLKEN

```
           <20ms
VDD   ___|‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾
DEN   _____|1|_|2|_|3|_|4|_|5|_|6|_|7|_|8|_|9|_|10|_|11|_|12|_____
Digital Input ___|‾‾‾‾‾‾‾DATA/DCLK/DE/Hsysr/Vsync‾‾‾‾‾‾‾‾‾‾‾‾
GRB   |>30ms|___|‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾
STBYB ____|‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾
Output _____< White ><  Normal dispaly
AVDD  _____|‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾
              |>0ms|
VGH   _____|‾‾‾‾‾‾‾‾‾‾‾‾‾
VGL                              |‾‾‾‾‾
              |>1ms|
BLKEN _____Backlight off_____|‾‾‾ Backlight on
                                   |>0ms|
```

Power-Off

STBYB -> BLKEN -> VGH -> VGL -> Digital input (Data/DCLK/DE)&Power(VDD/AVDD)

```
VDD   ‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾\____
DEN   |0|_|1|_|2|_|3|_|4|_|5|_|6|_|7|_|8|_\____
Digital Input |‾‾‾DATA DCLK/DE/Hsync/Vsync‾‾‾‾\____
STBYB ‾‾‾|_____
Source Output  Normal dispaly >< White >< Black  \____
AVDD  ‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾\____
                                  |>1ms| |>0 1ms|
VGH   ‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾_____
VGL   ‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾_____
BLKEN ____|‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾‾
```

DEN : Defined a frame period and created internally by DE. It is similar vertical sync.

GRB : Global reset ,normally pulled high.
Suggest to connecting with an RC reset circuit for stability .Normally pull high.
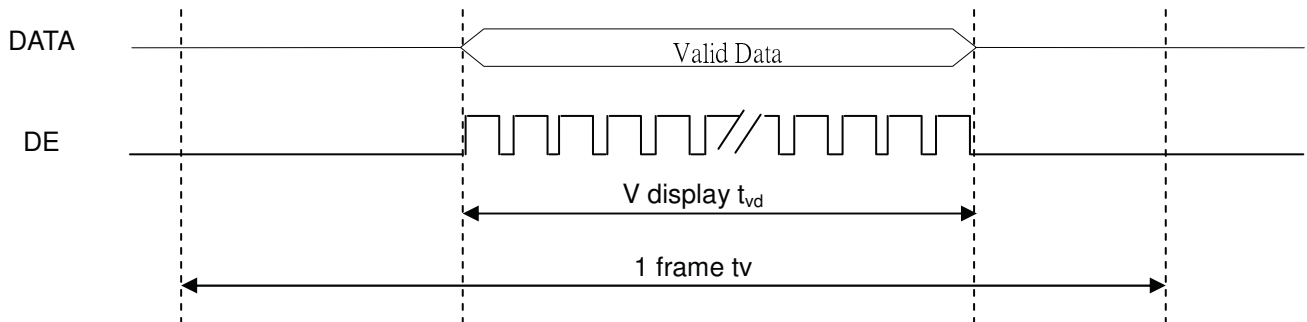
STBYB : Standby mode, normally pulled high.
STBYB ="1" , normal operation
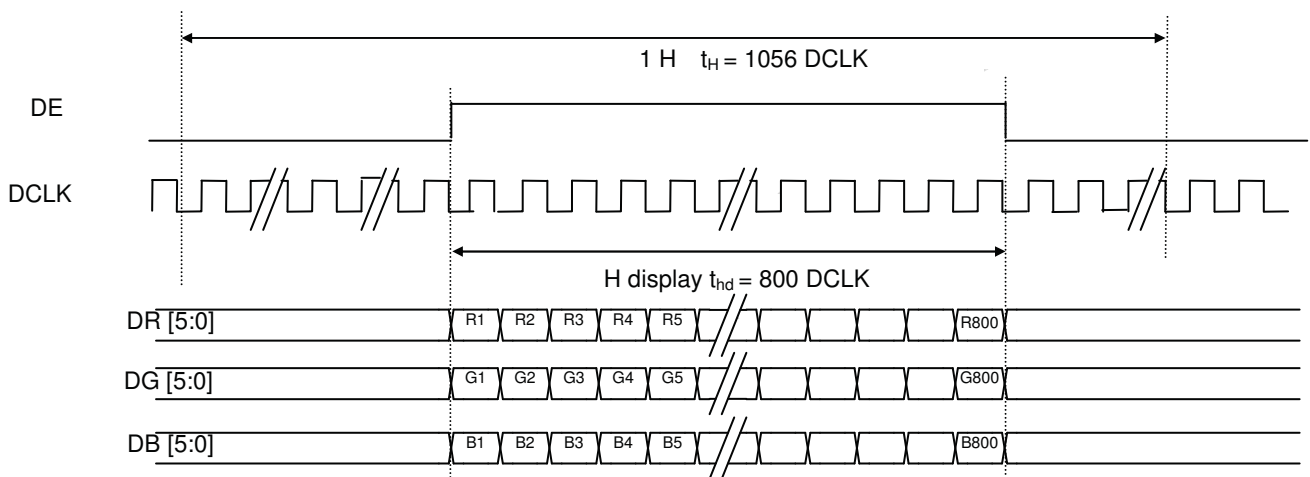STBYB="0",timing controller, source driver will turn off, all output are High-Z

b. Timing Condition

Item	Symbol	Min	Typ	Max	Unit	Remark
Clock frequency	dclk	-	33.3	45	MHZ	
DCLK cycle time	Tdclk	22	30	-	ns	
DCLK pulse duty	Tcwh	40	50	60	%	
Vertical display area	Tvd	480	480	480	H	
Vertical period area	Tv	522	525	762	H	
Vertical blanking area	Tvb	42	45	282	H	
Vertical pulse width	Tvw	-	3	-	H	
Vertical back porch	Tve	-	32	-	H	
Vertical front porch	Tvf	10	13	250	H	
Horizontal display area	Thd	800	800	800	dclk	
Horizontal period area	Th	910	1056	1138	dclk	
Horizontal blanking area	Thb	110	256	338	dclk	
Horizontal pulse width	Thw	1	1	-	dclk	
Horizontal back porch	The	88	88	88	dclk	
Horizontal front porch	Thf	22	168	250	dclk	
Data setup time	Tds	8	-	-	ns	
Data hold time	Tdh	8	-	-	ns	

c. Timing Diagram   (DE Mode)
Vertical Timing of Input

DATA

DE

V display t_{vd}

1 frame tv

Horizontal Timing of Input

1 H t_H = 1056 DCLK

DE

DCLK

H display t_{hd} = 800 DCLK

DR [5:0]   R1 R2 R3 R4 R5   R800

DG [5:0]   G1 G2 G3 G4 G5   G800

DB [5:0]   B1 B2 B3 B4 B5   B800

Clock and Data Timing of Input

t_{DCLK}

DCLK   VIH   VIL

t_{ds} t_{dh}

DR/DG/DB   VIH   VIL

1st   2nd
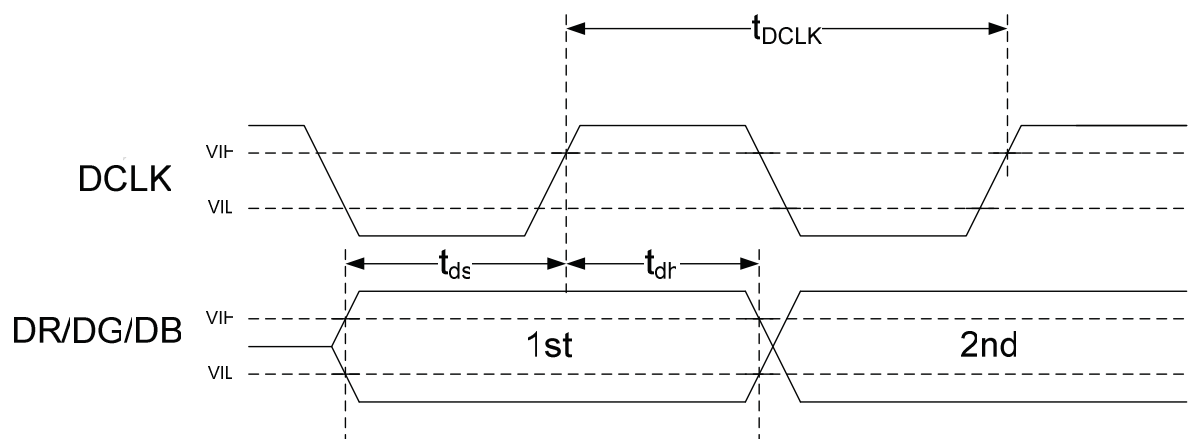
d. Timing Diagram   (HV Mode)

Vertical Timing of Input
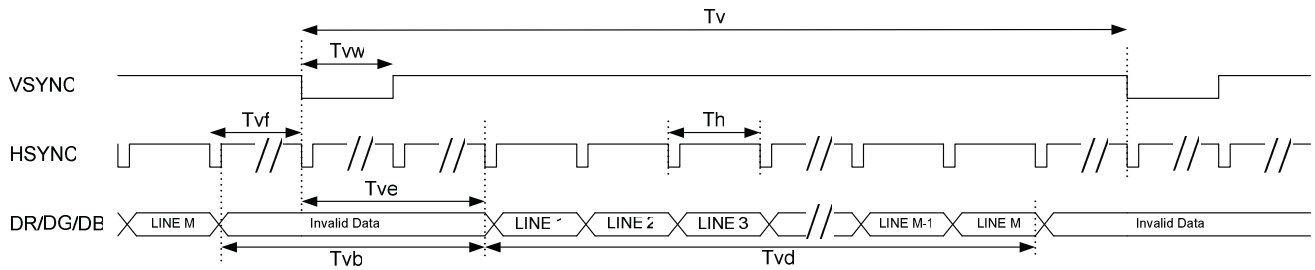
Horizontal Timing of Input
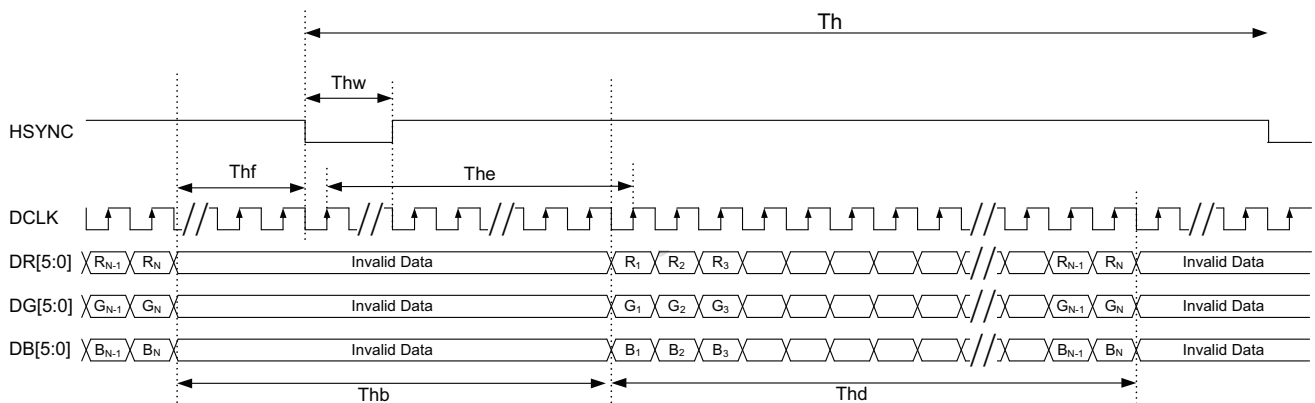
F. Optical specifications (Note 1, 2)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time Rise Fall	Tr Tf	$\theta=0°$	- -	10 25	15 30	ms ms	Note 3
Contrast ratio	CR	At optimized viewing angle	800	1500	-		Note 4, 5, 6
Viewing Angle Top Bottom Left Right		CR$\geqq$10	75 75 75 75	80 80 80 80	- - - -	deg.	Note 7, 8
Brightness	Y_L	$\theta=0°$	390	450	-	cd/m^2	Note 9
White Chromaticity	X	$\theta=0°$	0.268	0.318	0.368		Note 8
	Y	$\theta=0°$	0.273	0.323	0.373		
Uniformity		-	80	-	-	%	Note 10

Note 1: Measurement should be performed in the dark room, optical ambient temperature =25°C, and backlight current I_L=80 mA

Note 2: To be measured on the center area of panel with a field angle of 1° by Topcon luminance meter BM-7, after 10 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" (Tr, Rising time) and from "white" to "black"(Tf, Falling time), respectively.
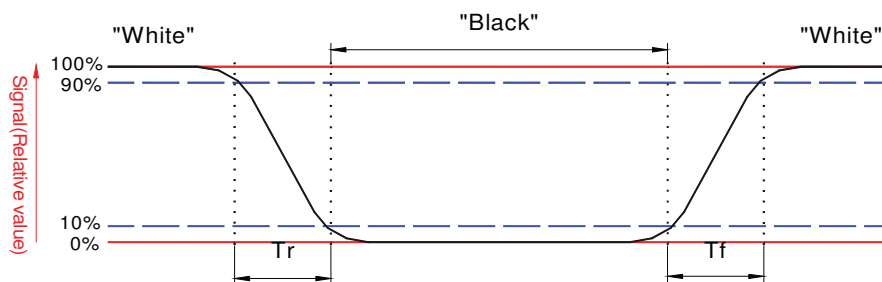
Note 4. From liquid crystal characteristics, response time will become slower and the color of panel will become darker when ambient temperature is below 25°C.

$$\text{Contrast ratio} = \frac{\text{Photo detector output when LCD is at "White" state}}{\text{Photo detector output when LCD is at "Black" state}}$$

Note 5. Contrast ratio is calculated with the following formula.

Note 6. White Vi=Vi50 $\mp$ 1.5V

Black Vi=Vi50 $\pm$ 2.0V

"±" means that the analog input signal swings in phase with COM signal.

"∓" means that the analog input signal swings out of phase with COM signal.

Vi50 :The analog input voltage when transmission is 50%

The 100% transmission is defined as the transmission of LCD panel when all the input terminals of module are electrically opened.

Note 7. Definition of viewing angle: refer to figure as below.
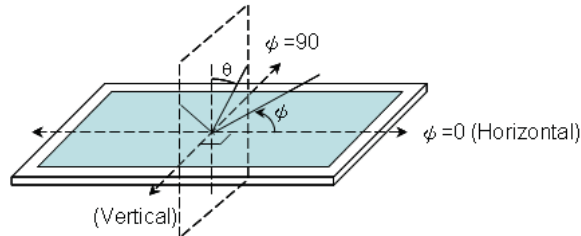
Note 8. The viewing angles are measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 9. Brightness is measured at the center of the display with white pattern in 80mA.

Note 10. Luminance Uniformity is defined as following within the 9 measurements (L1~L9),

Luminance Uniformity(%) =Minimum luminance(brightness)/Maximum luminance(brightness)
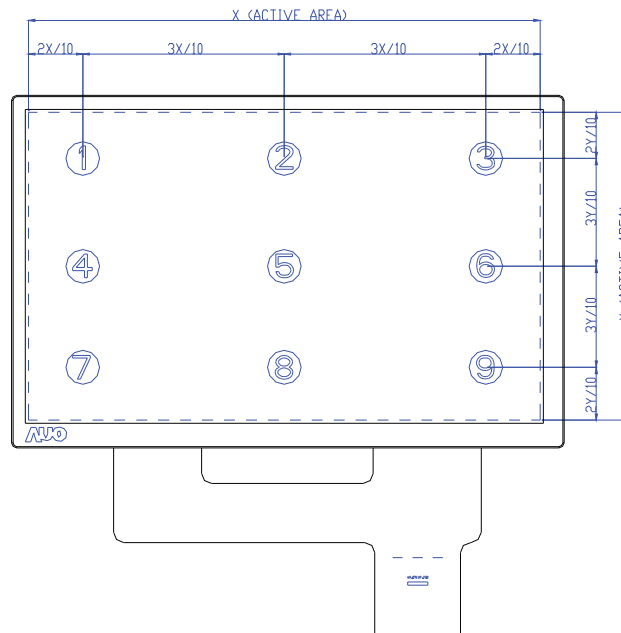
G. Reliability Test Items (Note 2)

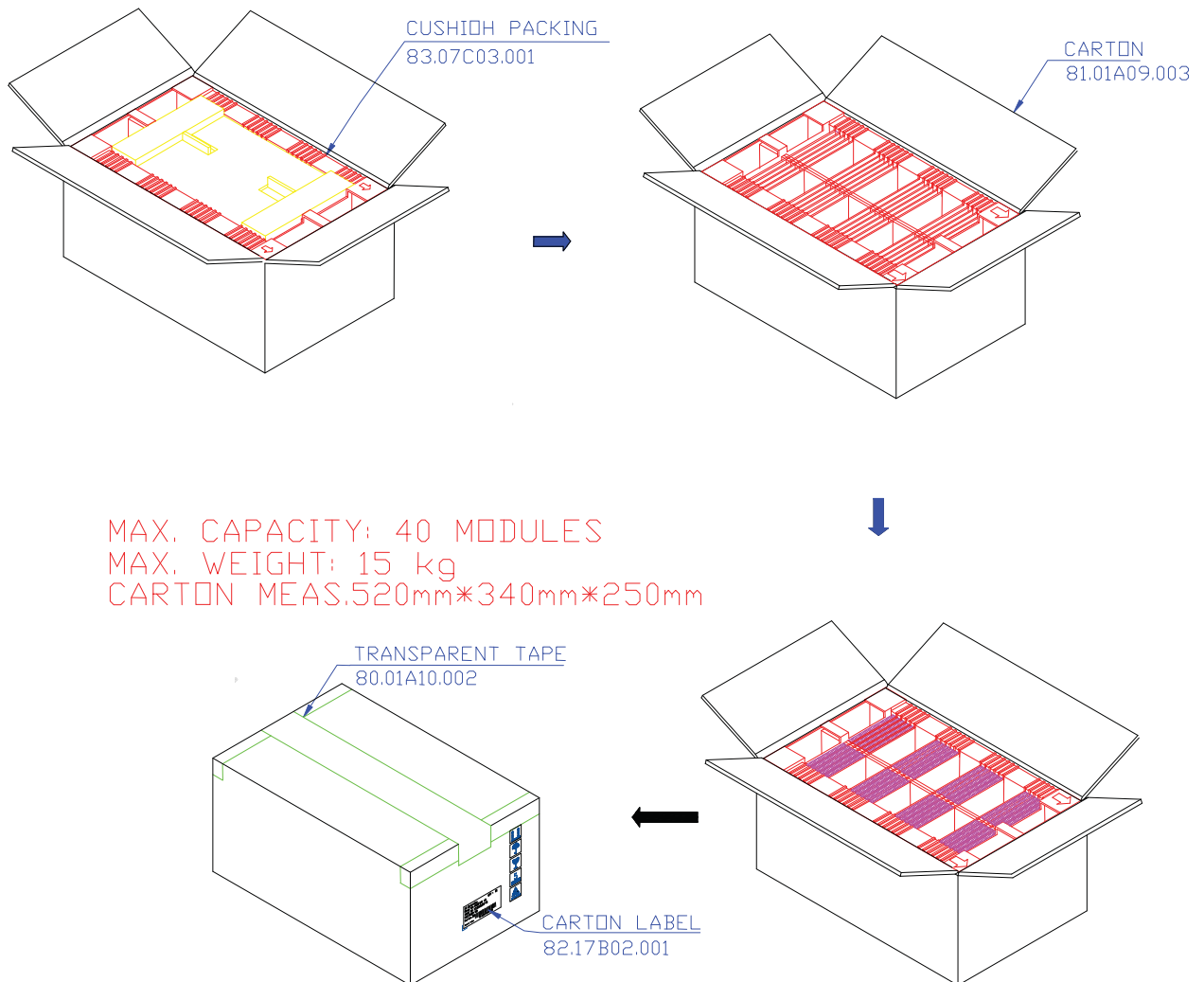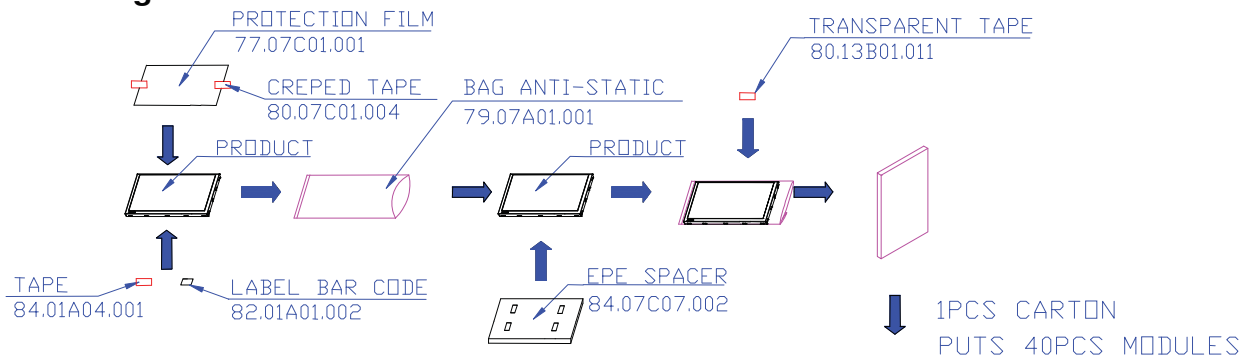| No.	Test items	Conditions		Remark
1	High temperature storage	Ta= 95℃	240Hrs	Note1
2	Low temperature storage	Ta= -40℃	240Hrs	
3	High temperature operation	Ta= 85℃	240Hrs	
4	Low temperature operation	Ta= -30℃	240Hrs	Note1, 3
5	High temperature and high humidity	Ta= 60℃, 90% RH	240Hrs	Operation
6	Heat shock	-30℃~85℃/100 cycles 1Hrs/cycle		Non-operation
7	Electrostatic discharge	Contact = ± 8 kV, class B (R=330,C=150pF) Air = ± 15 kV, class B (R=330,C=150pF) ,once for each terminal		Operation
8	Vibration	Frequency range	8~33.3Hz	JIS D1601,A10 Condition A
		Stoke	1.3mm	
		Sweep	2.9G, 33.3~400Hz	
		Cycle	15min.	
		2 hours for each direction of X, Z 4 hours for Y direction		
9	Mechanical shock	100G, 6ms, ±X,±Y,±Z 3 times for each direction		
10	Vibration (with carton)	Random vibration: $0.015G^2$/Hz from 5~200Hz –6dB/Octave from 200~500Hz		IEC 68-34
11	Drop (with carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces		

Note 1: Ta: Ambient temperature.
Note 2: In the standard condition, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.
Note 3: Short time operation between -40℃~-30℃ doesn't provide full performance but a correct image on the LCD. The LCD is guaranteed to suffer no permanent damage.

H. Packing Form and Marking

1. Packing Form

PROTECTION FILM
77.07C01.001

TRANSPARENT TAPE
80.13B01.011

CREPED TAPE
80.07C01.004

BAG ANTI-STATIC
79.07A01.001

PRODUCT

PRODUCT

TAPE
84.01A04.001

LABEL BAR CODE
82.01A01.002

EPE SPACER
84.07C07.002

1PCS CARTON
PUTS 40PCS MODULES

CUSHION PACKING
83.07C03.001

CARTON
81.01A09.003

MAX. CAPACITY: 40 MODULES
MAX. WEIGHT: 15 kg
CARTON MEAS.520mm*340mm*250mm

TRANSPARENT TAPE
80.01A10.002

CARTON LABEL
82.17B02.001

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: L3A (The manufacturing site at Taiwan)
Note:
1.   M06: The manufacturing site in Taiwan
2.   S16: The manufacturing site in Xiamen

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 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 reprents the last number of the year

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