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## CUSTOMER APPROVAL SHEET

<b>Company Name</b>	
<b>MODEL</b>	C070VVN02.0
<b>CUSTOMER APPROVED</b>	Title :  Name :

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

AUO PM :

P/N : 97.07C13.000

Comment :

Design base on the sample that deliery in 2012 Jan except upper POL changing from HC to AG380ARS.

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Date	2012/05/24

## Product Specification

### 7" COLOR TFT-LCD MODULE

**Model Name :** **C070VVN02.0**

**Planned Lifetime:** From 2011/Oct To 2017/Jun  
**Phase-out Control:** TBD  
**EOL Schedule:** TBD

<◆> Preliminary Specification

< > Final Specification

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

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## A. General Description

C070VVN02.0 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

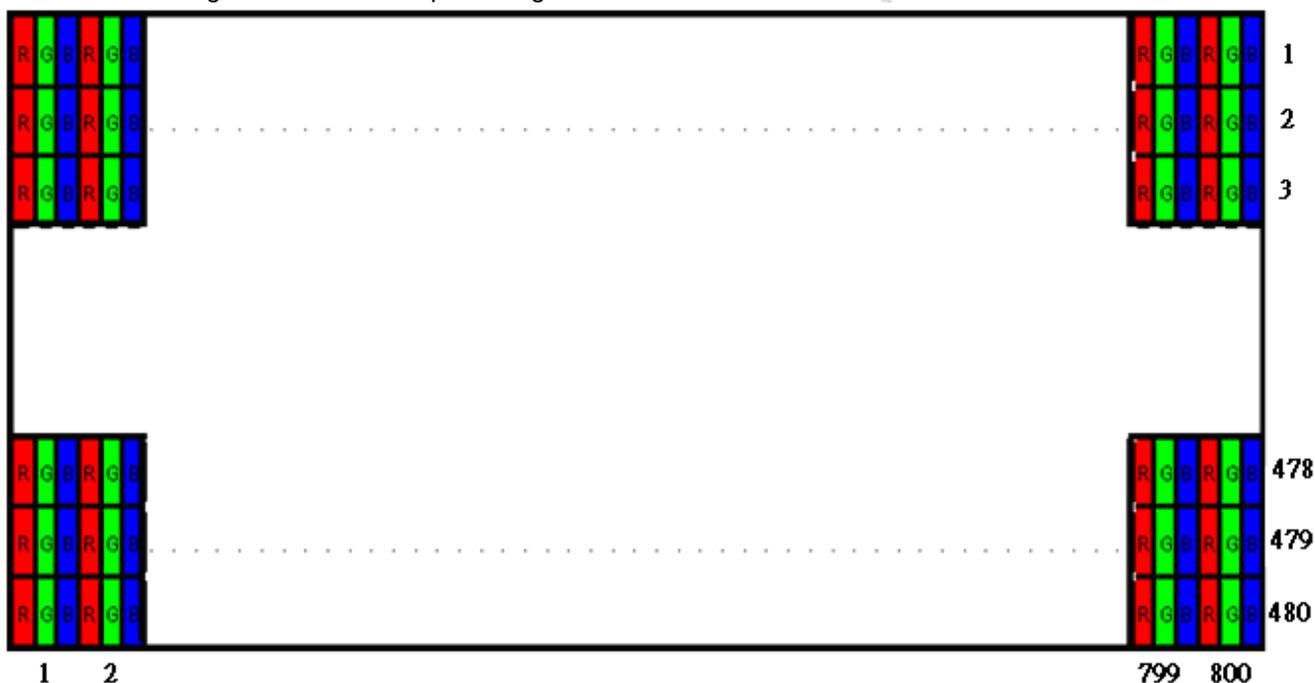


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### C. Physical Specifications

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	165	
9	Display Mode	--	Normally Black	
10	Surface Treatment		AGAR	

Note 1: Below figure shows dot stripe arrangement.

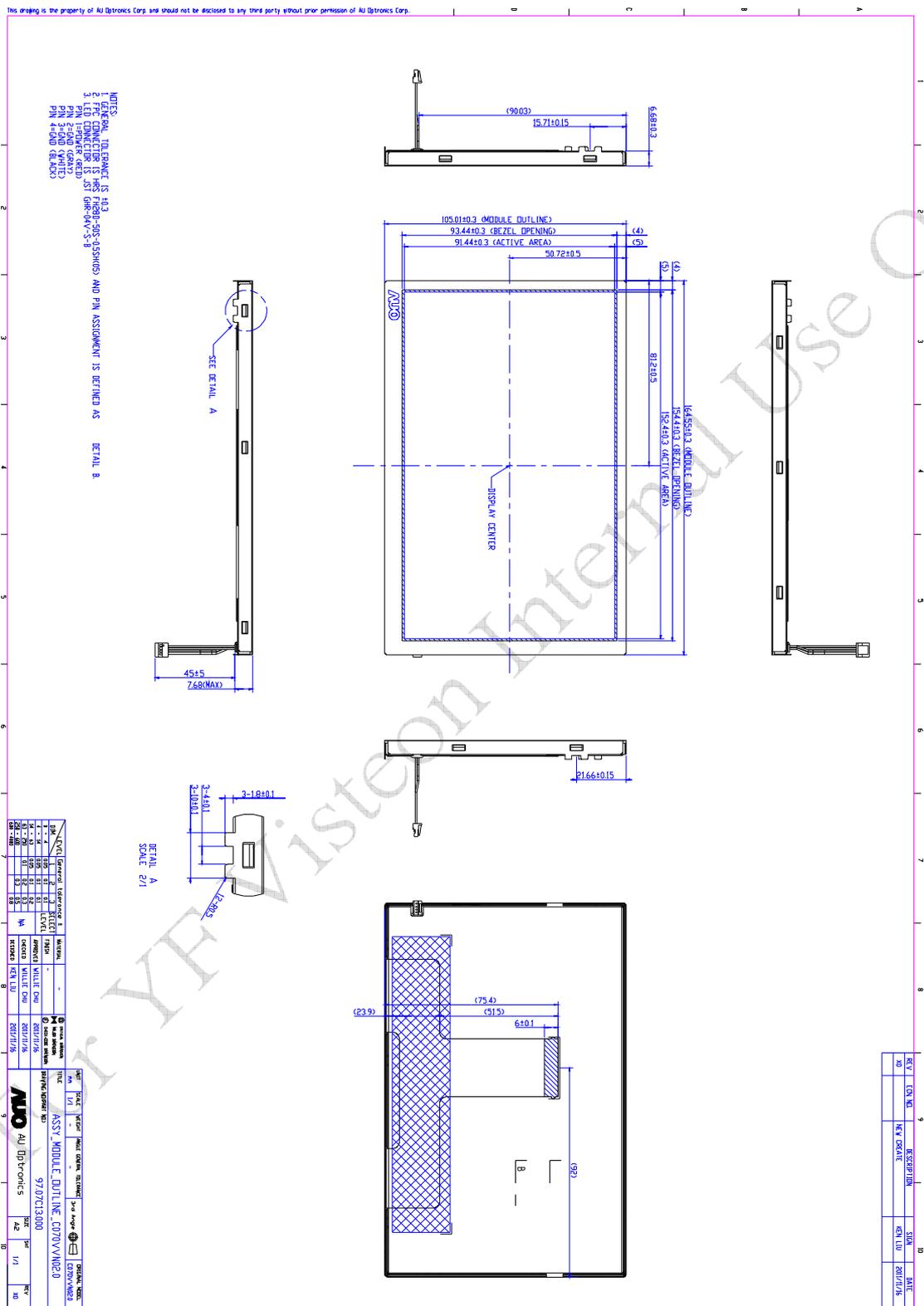


Note 2: Not including FPC. Please refer to the drawing in page 6 for further information.



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D. Outline Dimension –



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## 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	DE	I	Data enable Input (High active)	
24	DCLK	I	Data clock Input	
25	GND	G	Ground	
26	DB5	I	Blue data input(MSB)	
27	DB4	I	Blue data input	
28	DB3	I	Blue data input	
29	DB2	I	Blue data input	
30	DB1	I	Blue data input	
31	DB0	I	Blue data input(LSB)	
32	DG5	I	Green data input (MSB)	
33	DG4	I	Green data Input	
34	DG3	I	Green data Input	
35	DG2	I	Green data Input	
36	DG1	I	Green data Input	
37	DG0	I	Green data Input (LSB)	
38	DR5	I	Red data input (MSB)	
39	DR4	I	Red data input	
40	DR3	I	Red data Input	
41	DR2	I	Red data Input	
42	DR1	I	Red data Input	
43	DR0	I	Red data Input (LSB)	
44	GND	G	Ground	
45	SHLR	I	Horizontal scan direction control. "H"→Left to Right; "L"→Right to Left	
46	UPDN	I	Vertical scan direction control. "H"→Down to Up; "L"→Up to Down	

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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	VCOM	PI	Common electrode driving voltage

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

## 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	°C	Ambient
Storage Temperature	Tstg	-40	+95	°C	Ambient
LED	Vf	-0.5	24	V	
	If	0	85	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	
	IVDD	--	6.7	13	mA	
	AVDD	V1+0.1	12.5	13.5	V	
	IAVDD	-	26	34	mA	
	VGH	14.5	15	15.5	V	
	IVGH	-	0.15	0.2	mA	
	VGL	-9.5	-9	-8.5	V	
	IVGL	-	0.2	0.3	mA	
	VCOM	5.15	5.25	5.35	V	
	IVCOM	-	0.3	0.65	uA	
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	VI	0	-	0.3Vdd		
Vertical cycle	f <sub>v</sub>	50	60	80	Hz	
Horizontal cycle	f <sub>H</sub>	28.9	31.5	42	kHz	
Dot Frequency	f <sub>DCLK</sub>		33.3	45	MHz	

\* V1 : Vref (V1) of gamma input signal.



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## b. Recommend Gamma Voltage

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Gamma Voltage	V1	-	12.26	-	V	
	V2	-	11.68	-	V	
	V3	-	10.44	-	V	
	V4	-	9.88	-	V	
	V5	-	9.45	-	V	
	V6	-	9.01	-	V	
	V7	-	6.75	-	V	
	V8	-	6.52	-	V	
	V9	-	4.18	-	V	
	V10	-	3.69	-	V	
	V11	-	3.22	-	V	
	V12	-	2.49	-	V	
	V13	-	1.06	-	V	
	V14	-	0.21	-	V	

Note. This gamma voltage is reference value of gamma 2.2 and AUO recommended at perpendicular.



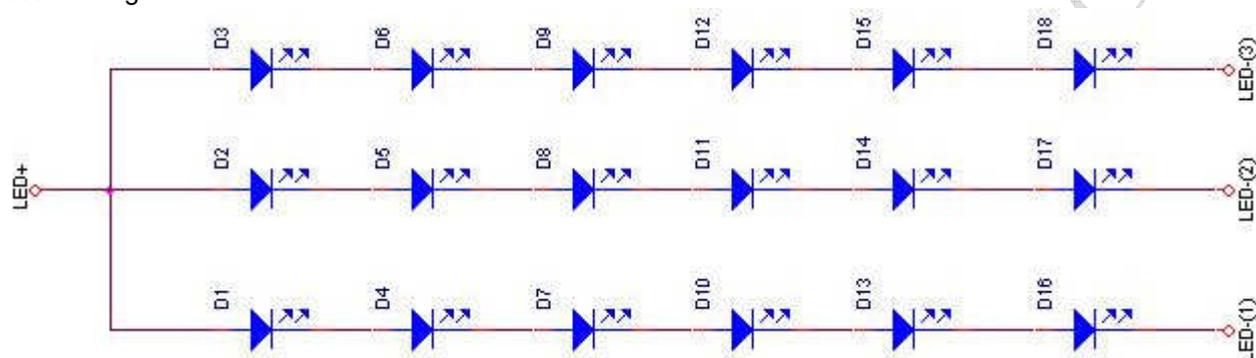
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### c. Backlight Driving Conditions (Note 1)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Supply Current	$I_L$	-	80	85	mA	single serial (Note 3)
LED Supply Voltage	$V_L$	-	21	24	V	Note 3
LED Life Time	$L_L$	10000	---	---	Hr	Note 2

Note 1: LED backlight is 18 LEDs (3 strings, 6pcs for each string).

Note 2: The LED lifetime 10000hrs means , after normal use at 80mA, under +25 ° C, the brightness decreases to 50% of original level.



Note 3: The LED supply power is for 3 string of LED



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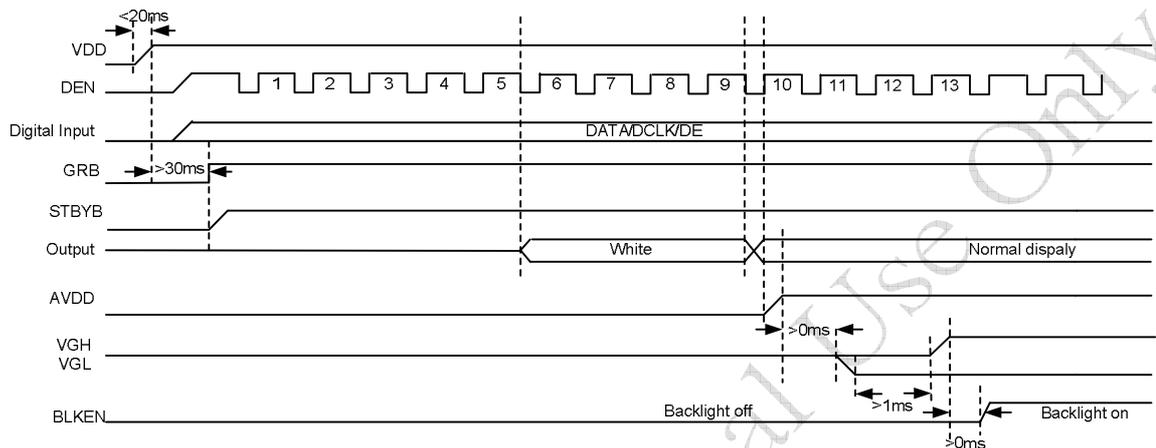
## 4. AC Timing

### 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:

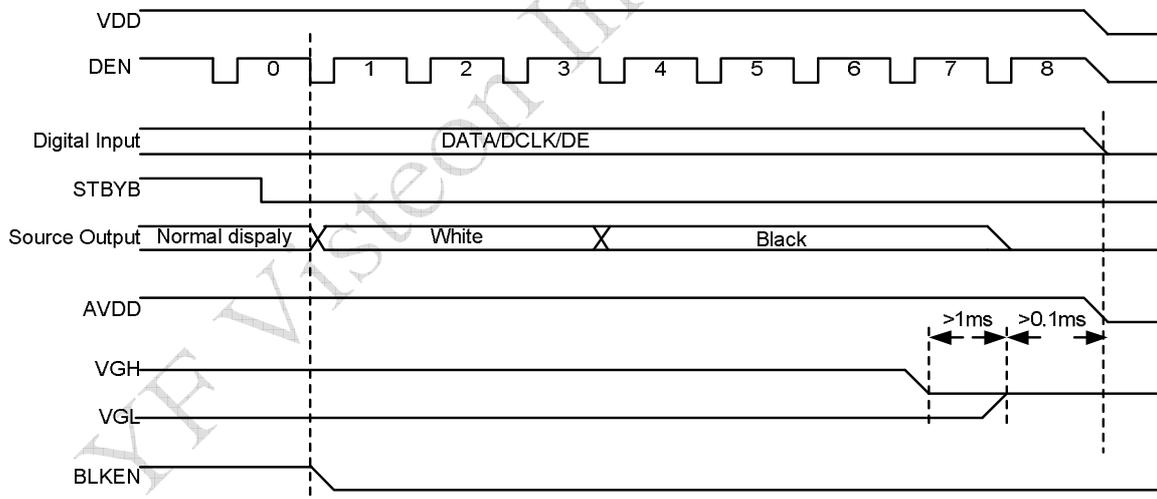
#### Power on sequence:

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



#### Power-Off

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



**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



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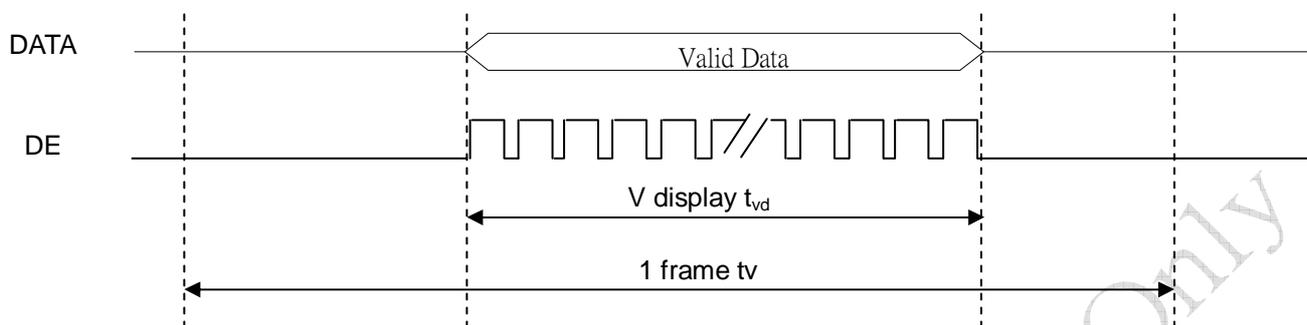
## b. Timing Condition

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	
Horizontal display area	Thd	800	800	800	dclk	
Horizontal period area	Th	910	1056	1138	dclk	
Horizontal blanking area	Thb	110	256	338	dclk	
Data setup time	Tds	8	-	-	ns	
Data hold time	Tdh	8	-	-	ns	

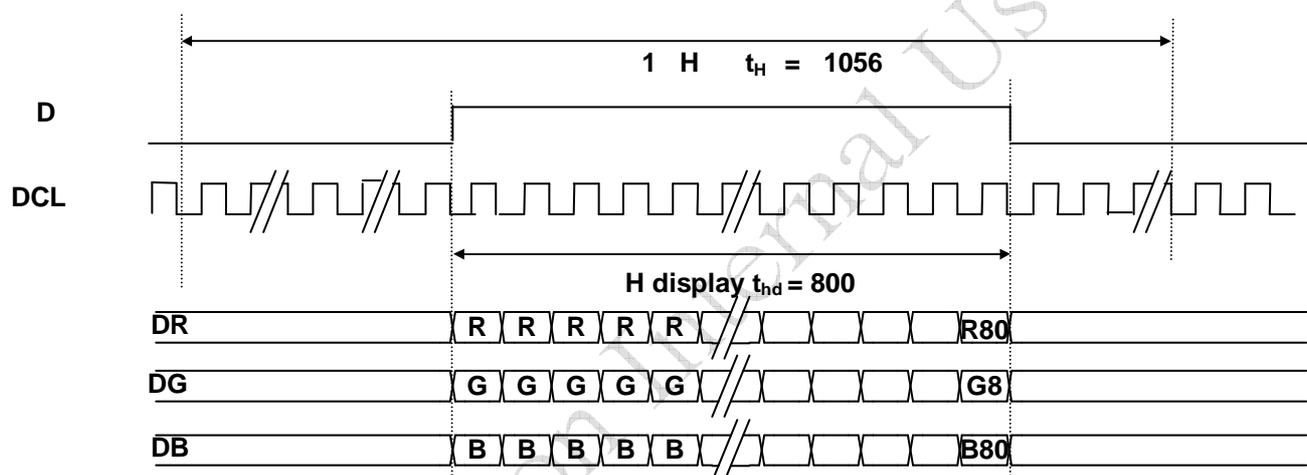


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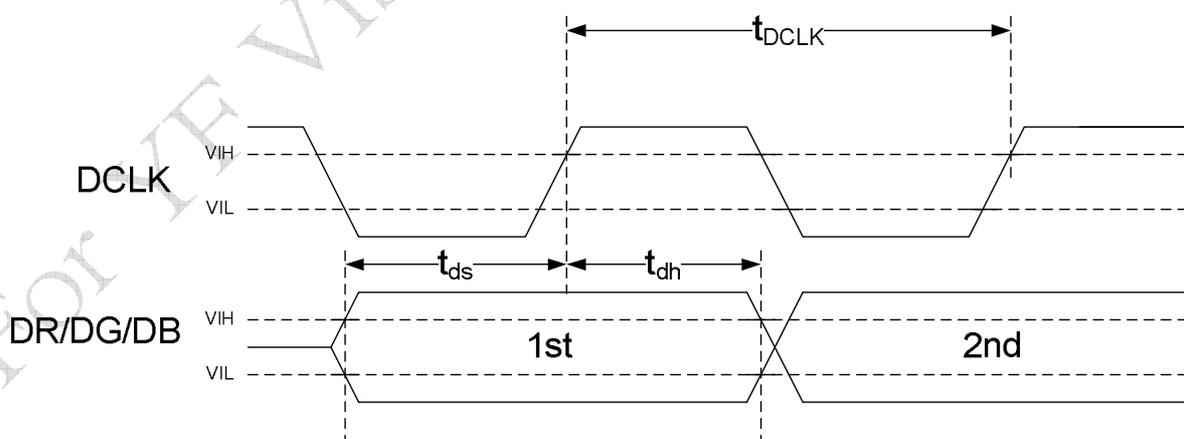
**c. Timing Diagram**  
**Vertical Timing of Input**



**Horizontal Timing of Input**



**Clock and Data Timing of Input**





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## F. Optical specifications (Note 1, 2)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time Rise Fall	Tr Tf	$\theta = 0^\circ$	- -	10 20		ms ms	Note 3
Contrast ratio	CR	At optimized viewing angle	1100	2000	-		Note 5, 6
Viewing Angle Top Bottom Left Right		$CR \geq 10$	- - - -	80 80 80 80	- - - -	deg.	Note 7, 8
Viewing Angle Top Bottom Left Right		$CR \geq 100$		40 40 60 60			
Brightness	$Y_L$	Perpendicular	650	-	-	cd/m <sup>2</sup>	Note 2
White Chromaticity	X	$\theta = 0^\circ$	0.275	0.305	0.335		Note 2
	Y	$\theta = 0^\circ$	0.310	0.340	0.370		
Red Chromaticity	X	$\theta = 0^\circ$	-	0.624	-		
	Y	$\theta = 0^\circ$	-	0.334	-		
Green Chromaticity	X	$\theta = 0^\circ$	-	0.358	-		
	Y	$\theta = 0^\circ$	-	0.574	-		
Blue Chromaticity	X	$\theta = 0^\circ$	-	0.151	-		
	Y	$\theta = 0^\circ$	-	0.118	-		
NTSC Ratio			-	55	-	%	
Uniformity (White)		-	80	-	-	%	Note 9

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 B M-7, after 10 minutes operation.

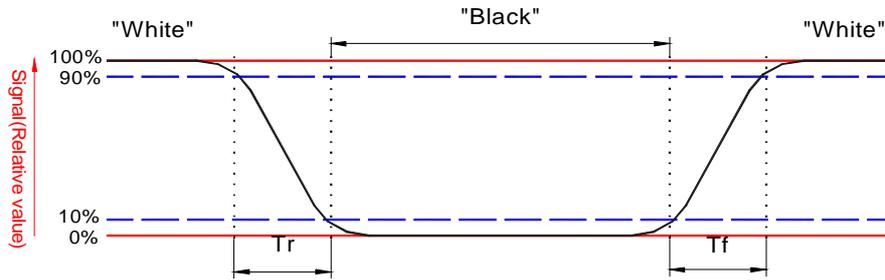
Note 3: Definition of response time:

The output signals of photo detector are measured when the input signals are changed from “black” to “white” (Ton, Rising time) and from “white” to “black”(Toff, Falling time), respectively.

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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.

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

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

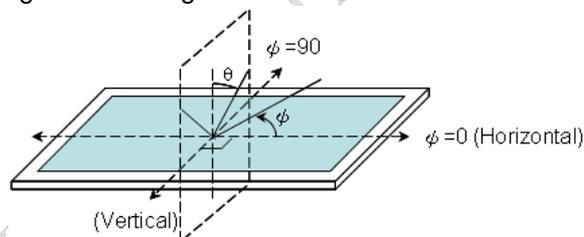
Note 6. White Vdata=V1 or V14

Black Vdata=V7 or V8

(For definition of V1, V7, V8 & V14, please refer to section G Appendix )

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

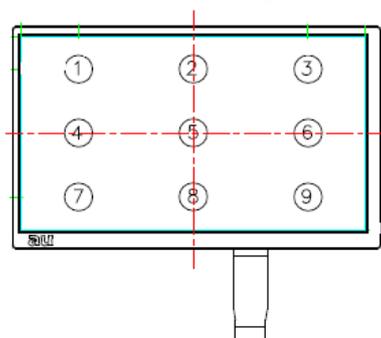
Note 7. Definition of viewing angle: refer to figure as below.



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

$$\text{Luminance Uniformity(\%)} = \frac{\text{Minimum luminance(brightness)}}{\text{Maximum luminance(brightness)}}$$





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## G. Reliability Test Items (Note 2)

No.	Test items	Conditions		Remark
1	High temperature storage	Ta= 95°C	240Hrs	Note1
2	Low temperature storage	Ta= -40°C	240Hrs	
3	High temperature operation	Ta= 85°C	240Hrs	
4	Low temperature operation	Ta= -30°C	240Hrs	Note1, 3
5	High temperature and high humidity	Ta= 60°C, 90% RH	240Hrs	Operation
6	Heat shock	-30°C~85°C/100 cycles 1Hrs/cycle		Non-operation
7	Electrostatic discharge	Contact = ± 8 kV, class B (R=330Ω, C=150pF) Air = ± 15 kV, class B (R=330Ω, C=150pF) ,10 times for each point		Operation (Note 3)
8	Vibration	Frequency range	8~33.3Hz	JIS D1601,A10 Condition A
		Stroke	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 <sup>2</sup> /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°C~-30°C doesn't provide full performance but a correct image on the LCD. The LCD is guaranteed to suffer no permanent damage.

Note 4: Test techniques follow IEC61000-4-2 standard





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## 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: S17

## 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 represents the last number of the year

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

## I. Others

### Recommended Storage Condition

When storing modules as spares for a period, the following precautions are necessary

(1) Store them in a dark place. Do not expose the module to sunlight or fluorescent light.

(a) Keep the temperature between 5°C and 35°C at normal humidity with a period no longer than 3 months as recommended condition.

(b) Keep the temperature at 60°C and 60%RH with a period no longer than 1 month as recommended condition.

(2) The polarizer surface should not come in contact with any other object. It is recommended that they be stored in the container in which they were shipped.