



CUSTOMER APPROVAL SHEET

Company Name	
MODEL	A070VTN06.0
CUSTOMER APPROVED	Title : Name :

APPROVAL FOR SPECIFICATIONS ONLY (Spec. Ver. 0.3)

APPROVAL FOR SPECIFICATIONS AND ES SAMPLE (Spec. Ver. 0.3)

APPROVAL FOR SPECIFICATIONS AND CS SAMPLE (Spec. Ver. 0.3)

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Version 0.3

Page: 2/21

Doc. Version	0.3
Total Page	21
Date	2014/08/27

Product Specification

7.0" COLOR TFT-LCD MODULE

Model Name: A070VTN06.0

< > Preliminary Specification

< > Final Specification

Note:

The content of this specification is subject to change.
All changes to delivery specification shall be notified in advance

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Record of Revision

Version	Revise Date	Page	Content
0.0	2014/01/13	All	First draft.
0.1	2014/02/27	17	Update viewing angle
0.2	2014/06/03	7	Update Outline Dimension (Bezel Opening, holes)
		10	Add recommend VCOM circuit
		11	Update Electrical Characteristics
		14	Update SYNC mode clock frequency max. value
0.3	2014/08/27	12	Add VCOM operating voltage note
		14	Update DE mode Vblanking maximum value (typo.)

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Contents

A. General Description	5
B. Features	5
C. Physical Specifications.....	6
D. Outline Dimension.....	7
E. Electrical Specifications	8
1. Pin assignment.....	8
2. Absolute Maximum Ratings.....	11
3. Electrical Characteristics	11
a. TFT- LCD Panel	11
b. Backlight Driving Conditions	12
4. AC Timing	13
a. Power on/off sequence.....	13
b. Timing Condition	14
c. Timing Diagram (DE Mode).....	15
d. Timing Diagram (SYNC Mode).....	16
F. Optical specifications	17
G. Reliability Test Items	19
H. Packing and Marketing	20
1. Packing Form.....	20
2. Module/Panel Label Information.....	21
3. Carton Label Information	21

A. General Description

A070VTN06.0 is an a-Si type Thin Film Transistor Liquid crystal Display (TFT-LCD). This model is composed with a TFT-LCD, Driver ICs, an FPC (flexible printed circuit), and a backlight unit.

B. Features

- 7-inch display
- 800 x 480 resolution in RGB stripe dot arrangement
- Parallel RGB 24-bits interface
- Wide viewing angle
- Green design

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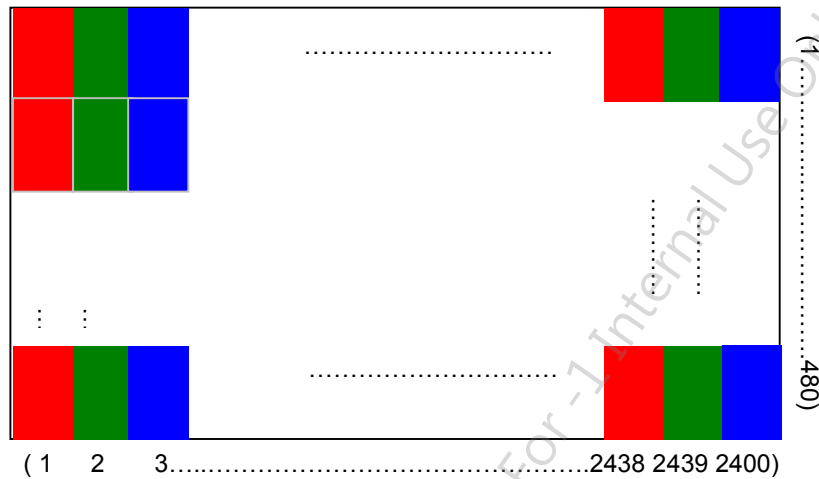
C. Physical Specifications

NO	Item	Unit	Specification	Remark
1	Display Resolution	dot	800 RGB (H) × 480(V)	
2	Active Area	mm	154.08(H) × 85.92(V)	
3	Screen Size	inch	7 (Diagonal)	
4	Dot Pitch	mm	0.0642 × 0.179	
5	Color Configuration	--	R. G. B. Stripe	Note 1
6	Color Depth	--	16.2M Colors	Note 2
7	Overall Dimension	mm	164.9(H) × 100(V) × 5.7(T)	Note 3
8	Weight	g	TBD	
9	Display Mode	--	Normally White	
10	Main Viewing Direction		6 O'clock	

Note 1: Dot stripe arrangement is shown as figure below.

Note 2: RGB 6-bit with 2-bit dithering

Note 3: Not including FPC. The further detail dimension drawing information is on next page.

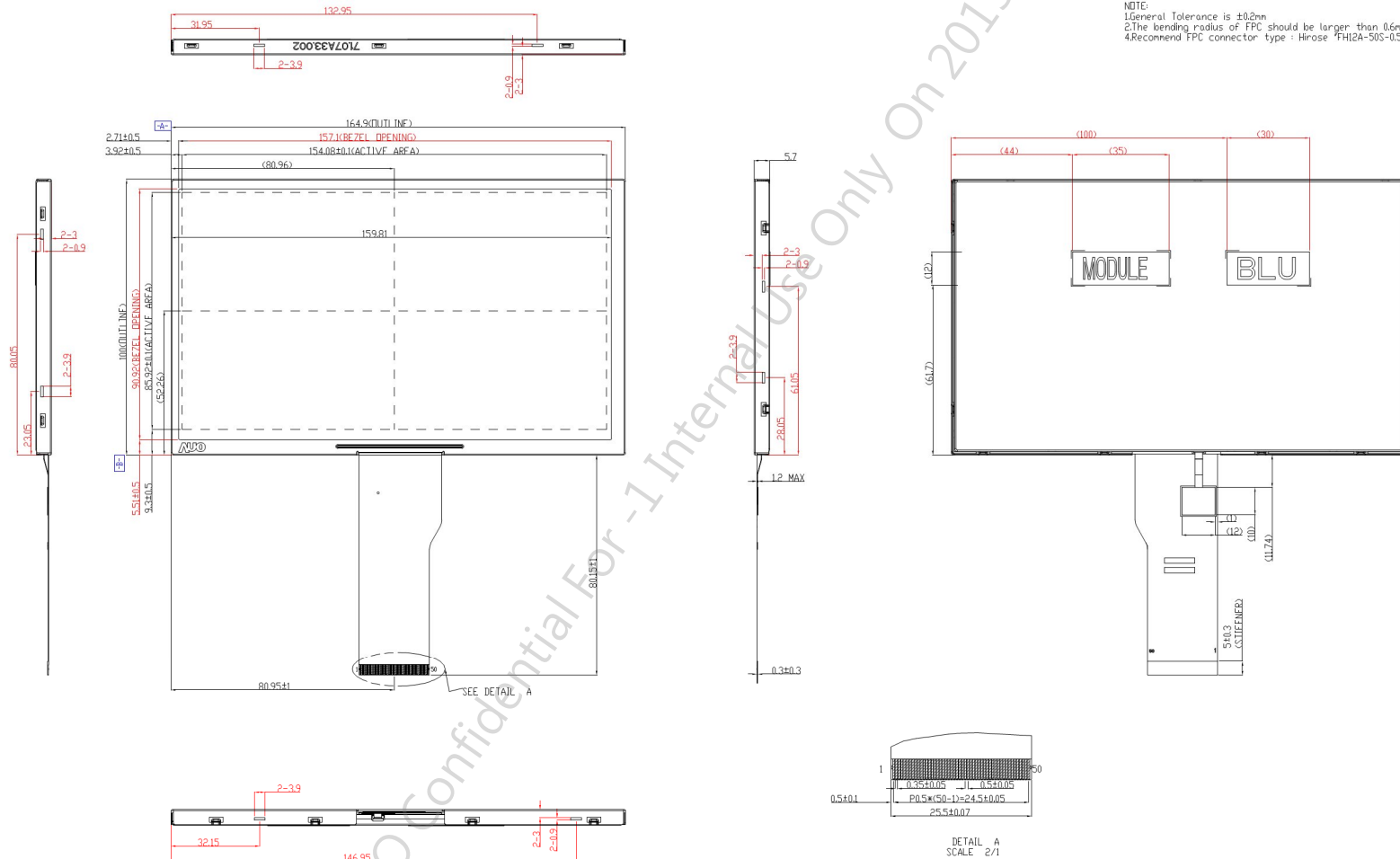




Version 0.3

Page: 7/21

D. Outline Dimension



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E. Electrical Specifications

1. Pin assignment

No.	Pin Name	I/O	Description	Remarks
1	VLED+	P	Power for LED backlight(Anode)	
2	VLED+	P	Power for LED backlight(Anode)	
3	VLED-	P	Power for LED backlight(Cathode)	
4	VLED-	P	Power for LED backlight(Cathode)	
5	GND	P	Power ground	
6	VCOM	I	Common voltage	
7	DVDD	P	Power for Digital Circuit	
8	MODE	I	DE/SYNC mode select	Note 1
9	DE	I	Data Input Enable	
10	VS	I	Vertical Sync Input	
11	HS	I	Horizontal Sync Input	
12	B7	I	Blue data(MSB)	
13	B6	I	Blue data	
14	B5	I	Blue data	
15	B4	I	Blue data	
16	B3	I	Blue data	
17	B2	I	Blue data	
18	B1	I	Blue data	Note 2
19	B0	I	Blue data(LSB)	Note 2
20	G7	I	Green data(MSB)	
21	G6	I	Green data	
22	G5	I	Green data	
23	G4	I	Green data	
24	G3	I	Green data	
25	G2	I	Green data	
26	G1	I	Green data	Note 2
27	G0	I	Green data (LSB)	Note 2
28	R7	I	Red data(MSB)	
29	R6	I	Red data	
30	R5	I	Red data	
31	R4	I	Red data	
32	R3	I	Red data	
33	R2	I	Red data	
34	R1	I	Red data	Note 2
35	R0	I	Red data (LSB)	Note 2
36	GND	P	Power ground	
37	DCLK	I	Sample clock	Note 3
38	GND	P	Power ground	
39	L/R	I	Left / right selection	Note 4,5
40	U/D	I	UP / down selection	Note 4,5

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41	VGH	P	Gate ON Voltage	
42	VGL	P	Gate OFF Voltage	
43	AVDD	P	Power for Analog Circuit	
44	RESET	I	Global reset pin	Note 6
45	NC	-	NO connection	
46	VCOM	I	Common Voltage	
47	DITHB	I	Dithering function	Note 7
48	GND	P	Power ground	
49	NC	-	NO connection	
50	NC	-	NO connection	

*** I: Input signal; P: Power source

Connector: FH12A-50S-0.5SH (Hirose)

Note 1: DE/SYNC mode select. Normally pull high.

When select DE mode, MODE="1", VS and HS must pull high.

When select SYNC mode, MODE="0", DE must be grounded.

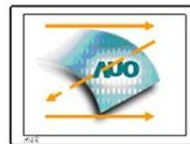
Note 2: When input 18 bits RGB data, the two low bits of R, G and B data must be grounded.

Note 3: Data shall be latched at the falling edge of DCLK.

Note 4: Selection of scanning mode

Scan direction input control		Descriptions
U/D	L/R	
GND	DVDD	From up to down, and left to right.
DVDD	GND	From down to up, and right to left.
GND	GND	From up to down, and right to left.
DVDD	DVDD	From down to up, and left to right.

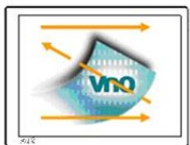
Note 5: Definition of scanning direction. Refer to the figure as below:



U/D = LOW ; L/R = HIGH



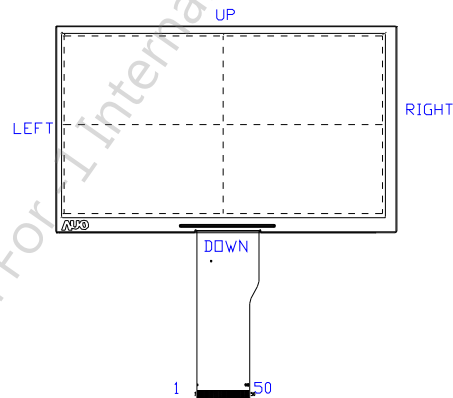
U/D = LOW ; L/R = LOW



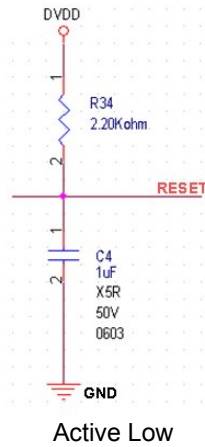
U/D = HIGH ; L/R = HIGH



U/D = HIGH ; L/R = LOW



Note 6: Global reset pin. Active low to enter reset state. Suggest to connect with an RC (R=2.2K ohm, C=1uF) reset circuit for stability. Normally pull high.



Note 7: Dithering function enable control, normally pull high.
 When DITHB="1", Disable internal dithering function,
 When DITHB="0", Enable internal dithering function.

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2. Absolute Maximum Ratings

Items	Symbol	Values		Unit	Condition
		Min.	Max.		
Power Voltage	DVDD	-0.3	5	V	Note 1,2
	AVDD	6.5	13.5	V	Note 1,2
	VGH	-0.3	40	V	Note 1,2
	VGL	-20	0.3	V	Note 1,2
	VGH - VGL	-	40	V	Note 1,2

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

Note 2: 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.

3. Electrical Characteristics

The following items are measured under stable condition.

a. TFT- LCD Panel

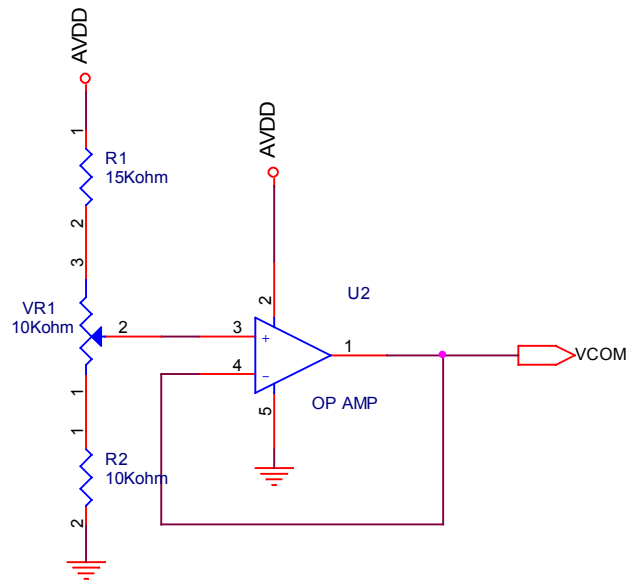
Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes	
Power supply	DVDD	3.0	3.3	3.6	V	Note 2	
	IDVDD	-	9.8	14.0	mA		
	AVDD	10.2	10.4	10.6	V	Note 2	
	IADVDD	-	13.1	20.0	mA		
	VGH	15.3	16.0	16.7	V	Note 2	
	IVGH	-	0.2	1.0	mA		
	VGL	-7.7	-7.0	-6.3	V	Note 2	
	IVGL	-	-0.2	-1.0	mA		
	VCOM	2.9	(3.4)	3.9	V	Note 3	
	IVCOM	-	2	3	uA		
Input signal voltage	H Level	V _{IH}	0.7*DVDD	-	DVDD	V	Note 1
	L Level	V _{IL}	0	-	0.3*DVDD		

Note 1: Digital Data

Note 2: Typical current test pattern

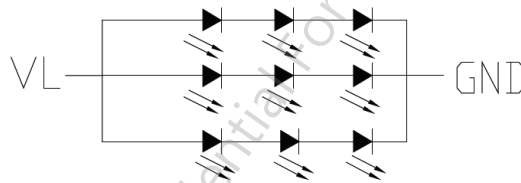


Note 3: Typical VCOM is only a reference value. It must be optimized according to each LCM.
 Please use VR and base on below application circuit. Suggest to connect with an VCOM circuit
 (R1=15Kohm, R2=10Kohm, VR=10Kohm)



b. Backlight Driving Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Supply Current	I_L	-	180	185	mA	
LED Supply Voltage	V_L	-	(9.6)	11.88	V	Note 1, 2
LED Life Time	L_L	10,000	---	---	Hr	Note 3



*** LED backlight is composed by total 9 LEDs (3 strings, 3pcs per string).

- Note 1: The LED backlight supply power is for 3 strings of LEDs.
- Note 2: The voltage capacity of LED driver IC must be over the max of LED Supply Voltage condition.
- Note 3: The LED lifetime 10,000hrs means: after 10,000hrs normally use at 180mA, under +25 , the brightness decreases to 50% of original level.

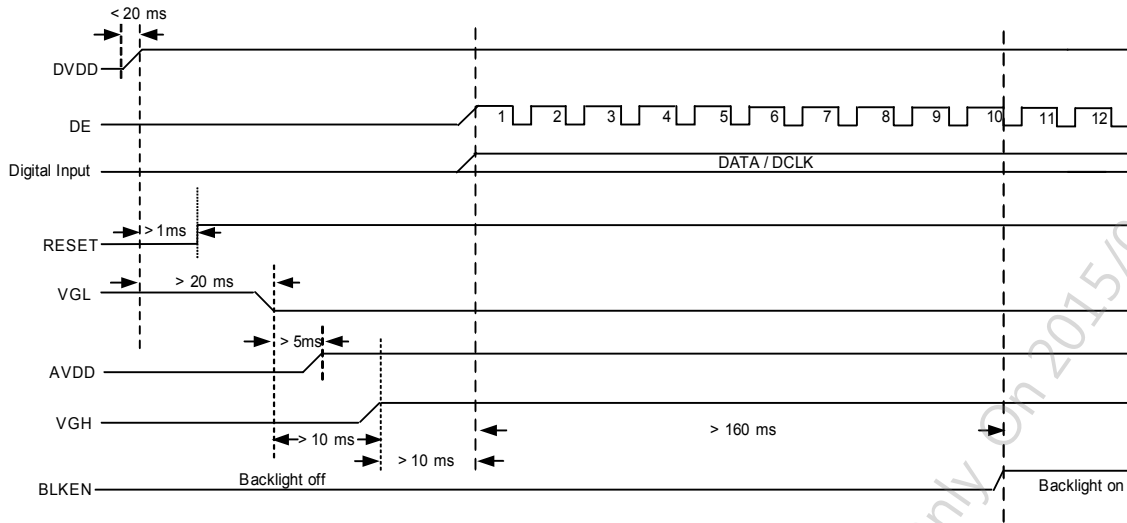
4. AC Timing

a. Power on/off sequence

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

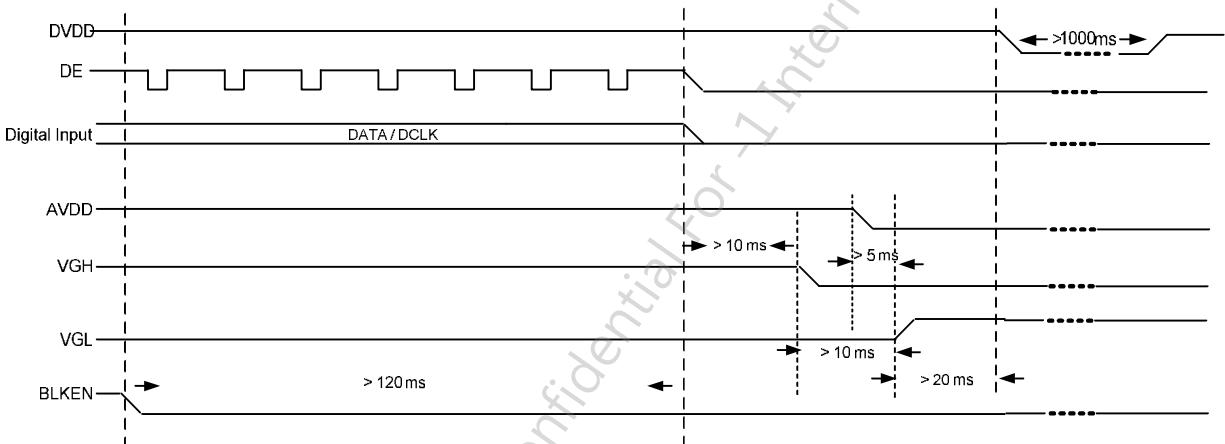
Power on sequence:

DVDD -> RESET -> VGL -> AVDD -> VGH -> Digital input (Data/DCLK/DE) -> BLKEN



Power off sequence:

BLKEN -> Digital input (Data/DCLK/DE) -> VGH -> AVDD -> VGL -> DVDD



b. Timing Condition
(DE MODE)

Parameter	Symbol	Min	Typ	Max	Unit
Clock frequency	DCLK	26.4	33.3	46.8	MHz
Frame rate	-	-	60	-	Hz
Horizontal Signal					
Horizontal display area	Thd	800			DCLK
Horizontal period area	Th	862	1056	1200	DCLK
Horizontal blanking area	Thb	62	256	400	DCLK
Vertical Signal					
Vertical display area	Tvd	480			TH
Vertical period area	Tv	510	525	650	TH
Vertical blanking area	Tvb	30	45	170	TH

(SYNC MODE)

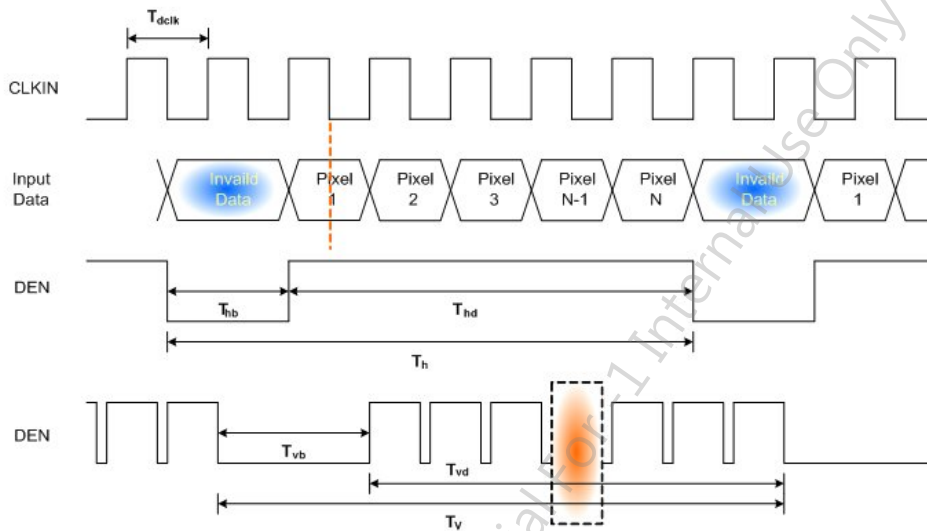
Parameter	Symbol	Min	Typ	Max	Unit
Clock frequency	DCLK	-	29.2	46.5	MHz
Frame rate	-	-	60	-	Hz
Horizontal Signal					
Horizontal display area	Thd	800			DCLK
Horizontal period area	Th	908	928	1088	DCLK
Horizontal blanking area	Thb	108	128	288	DCLK
Horizontal pulse width	Thw	1	48	87	DCLK
Horizontal back porch	The	88	88	88	DCLK
Horizontal front porch	Thf	20	40	200	DCLK
Vertical Signal					
Vertical display area	Tvd	480			TH
Vertical period area	Tv	517	525	712	TH
Vertical blanking area	Tvb	42	45	232	TH
Vertical pulse width	Tvw	3	3	3	TH
Vertical back porch	Tve	32	32	32	TH
Vertical front porch	Tvf	5	13	200	TH

(AC Electrical Characteristics)

Parameter	Symbol	Min	Typ	Max	Unit
HS setup time	Thst	8	-	-	ns
HS hold time	Thhd	8	-	-	ns
VS setup time	Tvst	8	-	-	ns
VS hold time	Tvhd	8	-	-	ns
Data setup time	Tdsu	8	-	-	ns
Data hold time	Tdhd	8	-	-	ns
DE setup time	Tesu	8	-	-	ns
DE hold time	Tehd	8	-	-	ns
DVDD Power On Slew rate	TPOR	-	-	20	ms
RESET pulse width	TRST	1	-	-	ms
DCLK cycle time	Tcoh	20	-	-	ns
DCLK pulse duty	Tcwh	40	50	60	%

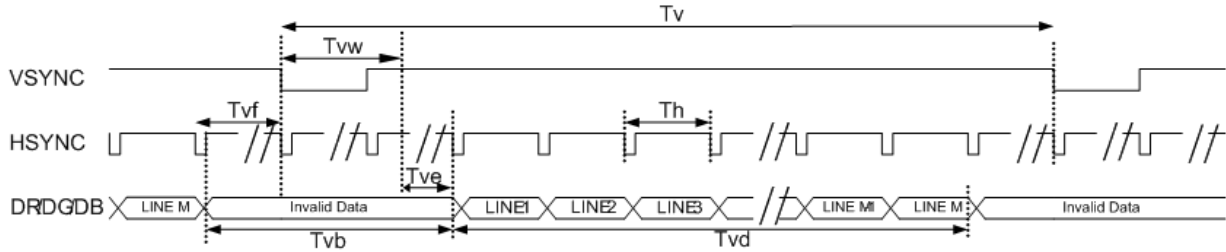
c. Timing Diagram (DE Mode)

Vertical Timing Input

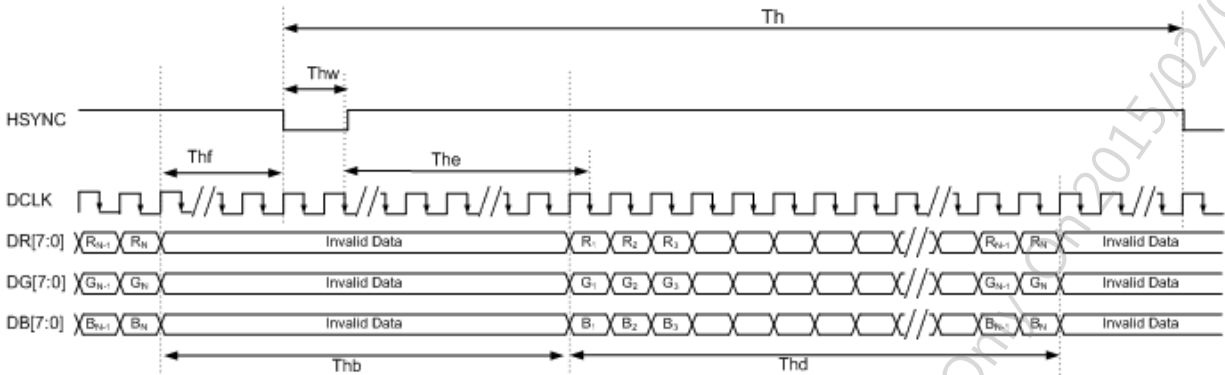


d. Timing Diagram (SYNC Mode)

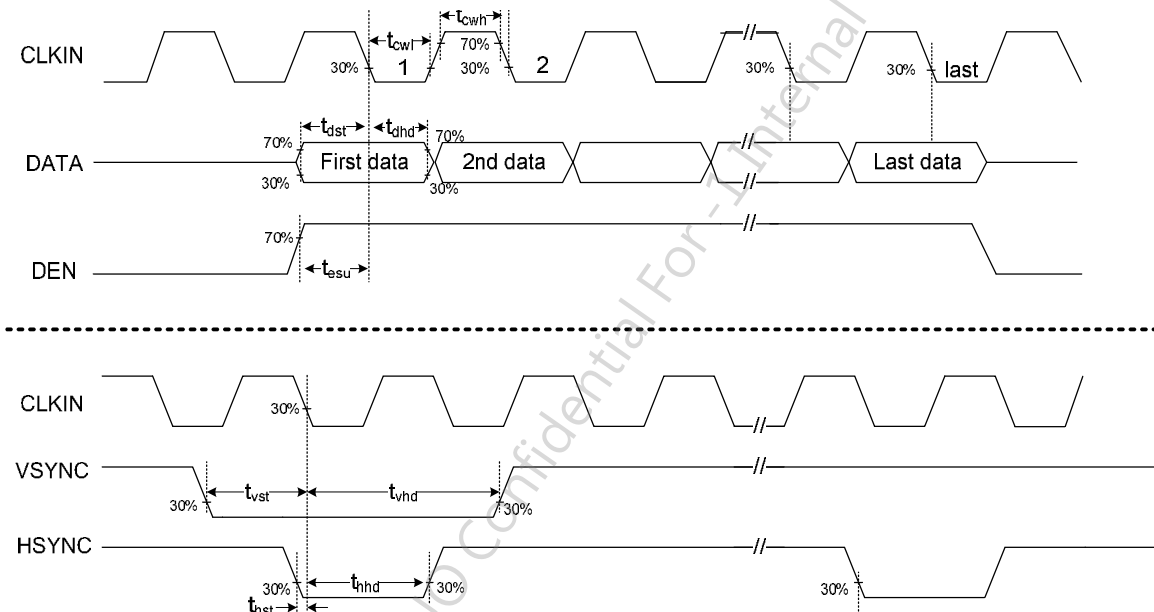
Vertical Timing Input



Horizontal Timing Input



DCLK and Data Timing Input



F. Optical specifications

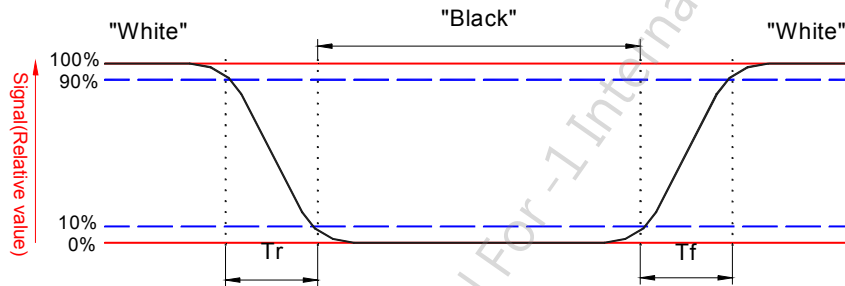
Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time	Tr + Tf	$\theta=0^\circ$	-	25	50	ms	Note 1,2
Contrast ratio	CR	At optimized viewing angle	400	500	-		Note 3
Viewing Angle	Top	CR 10	35	40	-	deg.	Note 4,5
	Bottom		55	60	-		
	Left		55	60	-		
	Right		55	60	-		
Brightness	Y_L	Perpendicular	320	400	-	cd/m ²	Note 6
Chromaticity	Wx	$\theta=0^\circ$	0.26	0.31	0.36		Note 7
	Wv		0.28	0.33	0.38		
Uniformity		-	70	75	-	%	Note 8

*** Optical measurement should be performed in the dark room, ambient temperature =25°C, and backlight current $I_L=180$ mA

*** To be measured on the center area of panel with a field angle of 1° by Topcon luminance meter SR-3, after 15 minutes operation.

Note 1: 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.

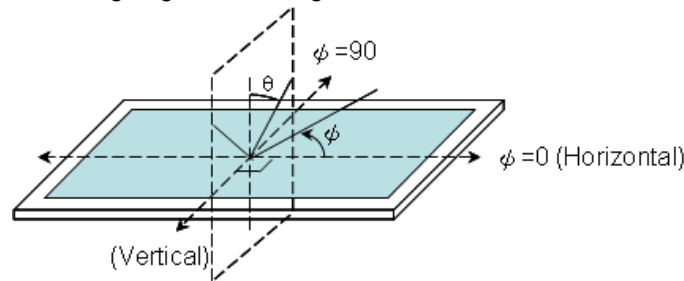


Note 2: From liquid crystal characteristics, response time will become slower and the color of panel will become darker when ambient temperature is below 25°C.

Note 3: 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 4: Definition of viewing angle: refer to figure as below.



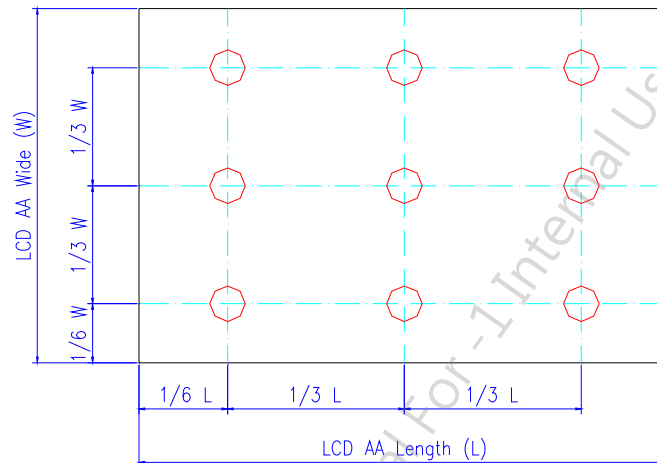
Note 5: The viewing angles are measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 6: Brightness is measured at the center of the display perpendicular to the panel surface.

Note 7: The chromaticity of R, G, and B is for reference only. The accurate data will base on the reality test.

Note 8: Luminance Uniformity is defined as following within the 9 measurements (L1~L9),

Luminance Uniformity(%) = Minimum brightness/Maximum brightness



G. Reliability Test Items

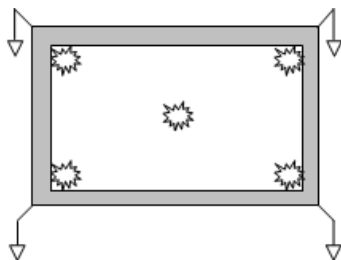
(Note 2)

No.	Test items	Conditions		Remark
1	High temperature storage	Ta= 85 °C	240Hrs	Note1
2	Low temperature storage	Ta= -30 °C	240Hrs	
3	High temperature operation	Ts= 85 °C	240Hrs	
4	Low temperature operation	Ta= -30 °C	240Hrs	Note1
5	High temperature and high humidity	Ts= 60 °C, 90% RH	240Hrs	Operation
6	Heat shock	-30 °C ~ 85 °C /100 cycles 1Hrs/cycle		Non-operation
7	Electrostatic discharge	Contact = ± 4 kV, class B (R=330Ω,C=150pF) Air = ± 8 kV, class B (R=330Ω,C=150pF)		Operation (Note 3)
8	Vibration	Frequency range	10 ~ 55Hz	JIS C7021,A10 Condition A
		Stoke	1.5mm	
		Sweep	10Hz ~ 55Hz ~ 10Hz	
		2 hours for each direction of X, Y, Z (6 hours for total)		
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, Ts: Panel surface temperature

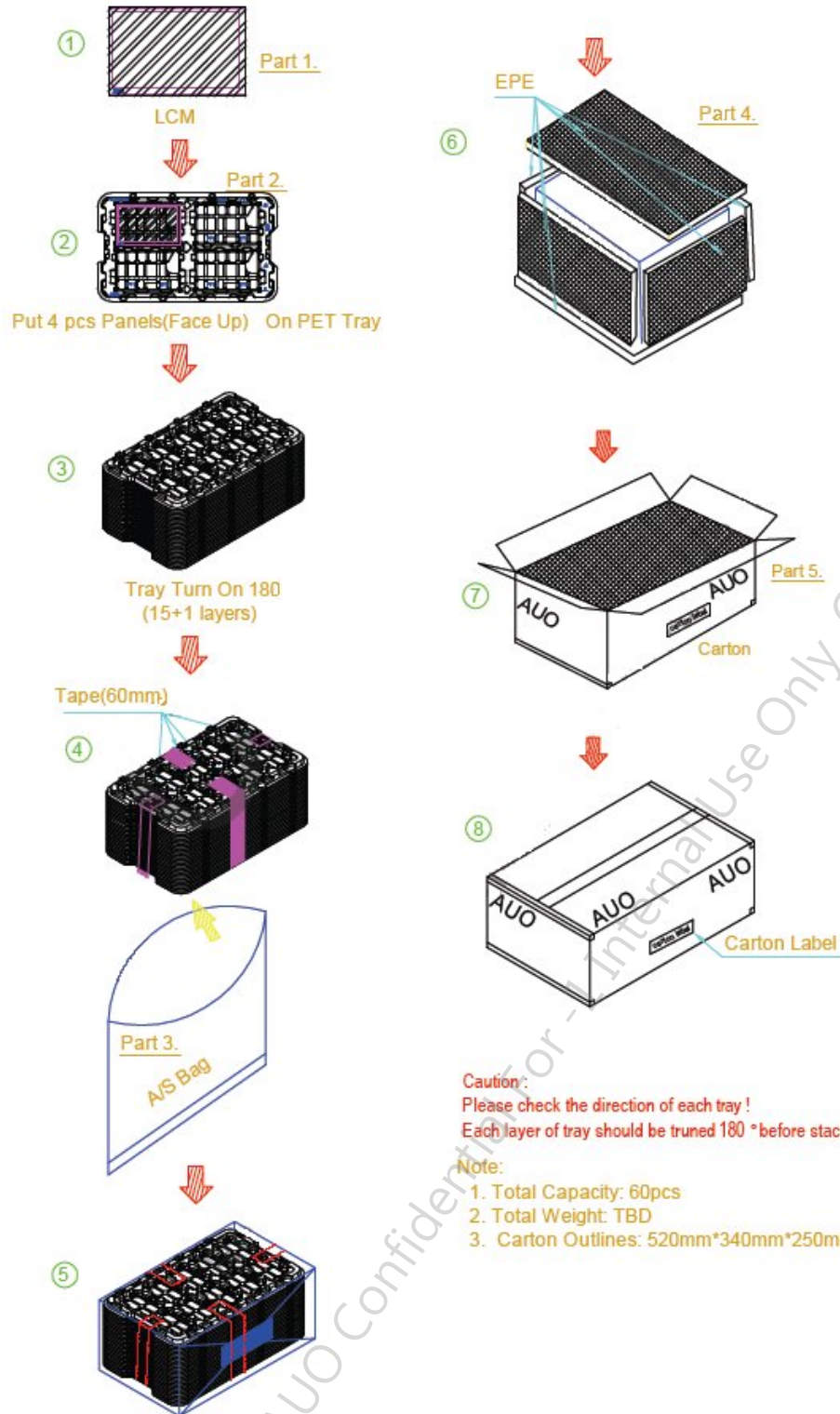
Note 2: In the standard condition, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.

Note 3: Test techniques follow IEC61000-4-2 standard. Test points and pattern as below.



H. Packing and Marketing

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 that 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 and printed with code 128 with the following definition:

ABCDEFGHIJKLMN OPQRST UV

- 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:

500S17ZL06123456781Z05:

Product Manufacturing Week Code: WK50

Product Version: Version 0

Product Manufacturing Factory: S17

Array / FEOL FAB Address:

1, JhongKe Rd., Central Taiwan Science Park, Taichung 40763, Taiwan, R.O.C.

Module FAB Address:

R403, South Torch Building, Torch Hi-Tech Industrial Development Zone, Xiamen, 361006, China

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.