



CUSTOMER APPROVAL SHEET

Company Name	
MODEL	A070VTN06.1
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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Product Specification

7.0" COLOR TFT-LCD MODULE

Model Name: A070VTN06.1

< > 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	2016/3/25	All	First Draft
0.1	2016/5/4	5	To modify the viewing direction in General Description To modify Note 2
		6	To modify the outline drawing
		8	To modify Note 2
		11	To modify Note 2
		15	To modify AC Electrical Characteristics in Timing Condition
0.2	2016/5/6	10	To insert VHG-VGL of Min. data in Absolute Maximum Ratings
		12 -17	To modify depiction and diagram in power on/off sequence and Electrical AC Characteristics
		20	To modify the Electrostatic discharge and Note 3 in Reliability Test Item
0.3	2016/06/30	5	To modify General Description
		11	To add the LED life time in Backlight Driving Conditions
		17	To add Chromaticity in Optical specifications
		21	To add Packing Form
0.4	2016/8/31	6	To update the outline drawing
		10	To insert IVDD and IAVDD in Electrical DE Characteristics
0.5	2016/9/19	6	To update the outline drawing
0.6	2016/11/01	6	To update the outline drawing
0.7	2016/12/16	6	To update the outline drawing
0.8	2018/6/8	6	Update the outline drawing
		20	Add the absorption angle of polarizer on note9



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A. General Description

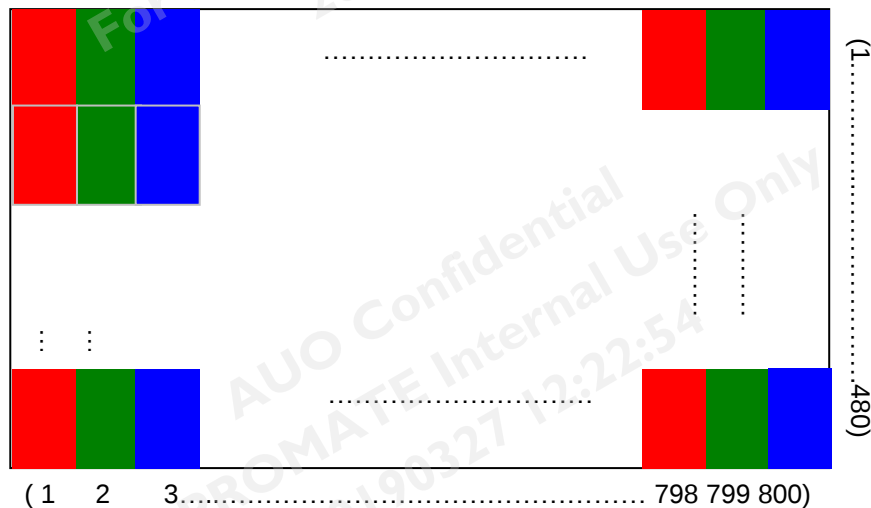
1. Display characteristics

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	--	65K Colors	Note 2
7	Overall Dimension	mm	166.43 (H) × 102.2 (V) × 6.3(T)	Note 3
8	Weight	g	TBD	
9	Display Mode	--	Normally White	
10	Viewing direction		6 o'clock (gray inversion)	

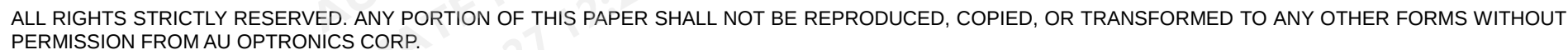
Note 1: Dot stripe arrangement is shown as figure below.

Note 2: Parallel RGB 16-bits interface

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



B. Outline Dimension



C. Electrical Specifications

1. Pin assignment

Connector : FH26W-51S-0.3SHW(05)

No.	Pin Name	I/O	Description	Remarks
1	GND	P	Power Ground	
2	VGL	P	Gate OFF Voltage	
3	NC	-	Not Connected	
4	VDD	P	Power for Digital Circuit	
5	NC	-	Not Connected	
6	VGH	P	Gate ON Voltage	
7	NC	-	Reserved for AUO internal test. Please treat it as NC.	
8	AVDD	P	Power for Analog Circuit	
9	AVDD	P	Power for Analog Circuit	
10	GND	P	Power Ground	
11	VSD	I	Vertical Sync Input	
12	HSD	I	Horizontal Sync Input	
13	DEN	I	Data Input Enable	
14	GND	P	Power Ground	
15	DCLK	I	Pixel Clock	Note 1
16	GND	P	Power Ground	
17	B4	I	Blue Data(MSB)	
18	B3	I	Blue Data	
19	B2	I	Blue Data	
20	B1	I	Blue Data	
21	B0	I	Blue Data(LSB)	
22	GND	P	Power Ground	
23	G5	I	Green Data(MSB)	
24	G4	I	Green Data	
25	G3	I	Green Data	
26	G2	I	Green Data	
27	G1	I	Green Data	
28	G0	I	Green Data(LSB)	
29	GND	P	Power Ground	
30	R4	I	Red Data(MSB)	
31	R3	I	Red Data	
32	R2	I	Red Data	
33	R1	I	Red Data	
34	R0	I	Red Data (LSB)	
35	GND	P	Power Ground	
36	MODE	I	DE/SYNC mode select	Note 2
37	SHLR	I	Left / Right Selection	Note 3,4
38	UPDN	I	Up / Down Selection	Note 3,4
39	RESET	I	Global Reset Pin.	Note 5

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40	VDD	P	Power for Digital Circuit	
41	VDD	P	Power for Digital Circuit	
42	GND	P	Power Ground	
43	GND	P	Power Ground	
44	AVDD	P	Power for Analog Circuit	
45	GND	P	Power Ground	
46	NC	-	Not Connected	
47	VLED1-	P	Power for LED Backlight(Cathode)	
48	VLED2-	P	Power for LED Backlight(Cathode)	
49	VLED3-	P	Power for LED Backlight(Cathode)	
50	VLED+	P	Power for LED Backlight(Anode)	
51	VLED+	P	Power for LED Backlight(Anode)	

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

Note 1: Data shall be latched at the falling edge of DCLK.

Note 2: DE/SYNC mode select. Normally pull high.
When select DE mode, MODE="1", VSD and HSD must pull Low.
When select SYNC mode, MODE="0", DEN must be grounded.

Note 3: Selection of scanning mode

Scan direction input control		Descriptions
UPDN	SHLR	
GND	VDD	From up to down, and left to right.
VDD	GND	From down to up, and right to left.
GND	GND	From up to down, and right to left.
VDD	VDD	From down to up, and left to right.

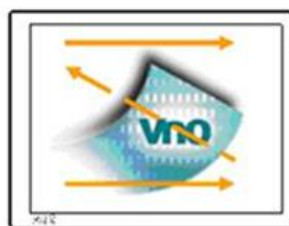
Note 4: Definition of scanning direction. Refer to the figure as below:



UPDN = LOW ; SHLR = HIGH



UPDN = LOW ; SHLR = LOW



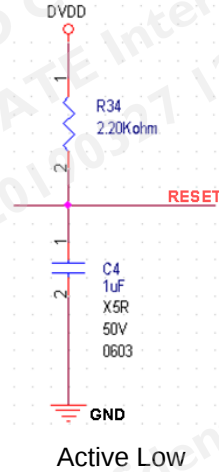
UPDN = HIGH ; SHLR = HIGH



UPDN = HIGH ; SHLR = LOW

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Note 5: 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.



2. Absolute Maximum Ratings

Items	Symbol	Values		Unit	Condition
		Min.	Max.		
Power Voltage	VDD	-0.3	3.9	V	Note 1,2
	AVDD	-0.3	13	V	Note 1,2
	VGH	-0.3	20	V	Note 1,2
	VGL	-10	0.3	V	Note 1,2
	VGH – VGL	15	30	V	Note 1,2

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

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 DC Characteristics

The following items are measured under stable condition.

a. TFT- LCD Panel

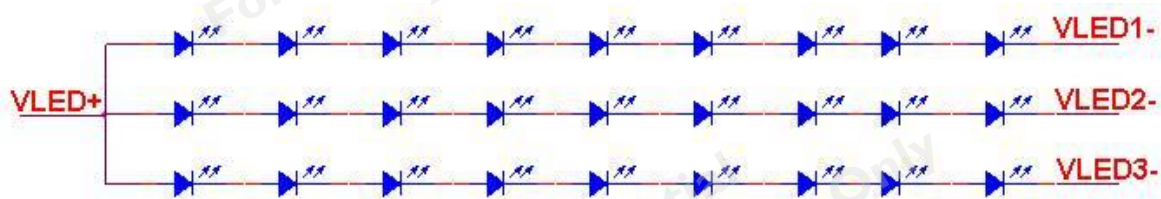
Parameter		Symbol	Min.	Typ.	Max.	Unit	Notes
Power Supply	VDD		3.0	3.3	3.6	V	Note 1
	IVDD		-	10.5	12.6	mA	
	AVDD		10.7	11	11.3	V	Note 1
	IAVDD		-	16	19.2	mA	
	VGH		15.3	16.0	16.7	V	Note 1
	IVGH		-	0.2	1.0	mA	
	VGL		-7.7	-7.0	-6.3	V	Note 1
	IVGL		-	-0.2	-1.0	mA	
Input Signal Voltage	H Level	VIH	0.7xVDD	-	VDD	V	
	L Level	VIL	0	-	0.3xVDD	V	

Note 1: Typical current test pattern



b. Backlight Driving Conditions

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Supply Current	I_L	-	195		mA	
LED Supply Voltage	V_L	-	26.55	29.7	V	Note 1, 2
LED Life Time	L_L	10000	---	---	Hr	Note 3



*** LED backlight is composed by total 27 LEDs (3 strings, 9pcs 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 195mA, under +25°C, the brightness decreases to 50% of original level.

4. Power on/off sequence

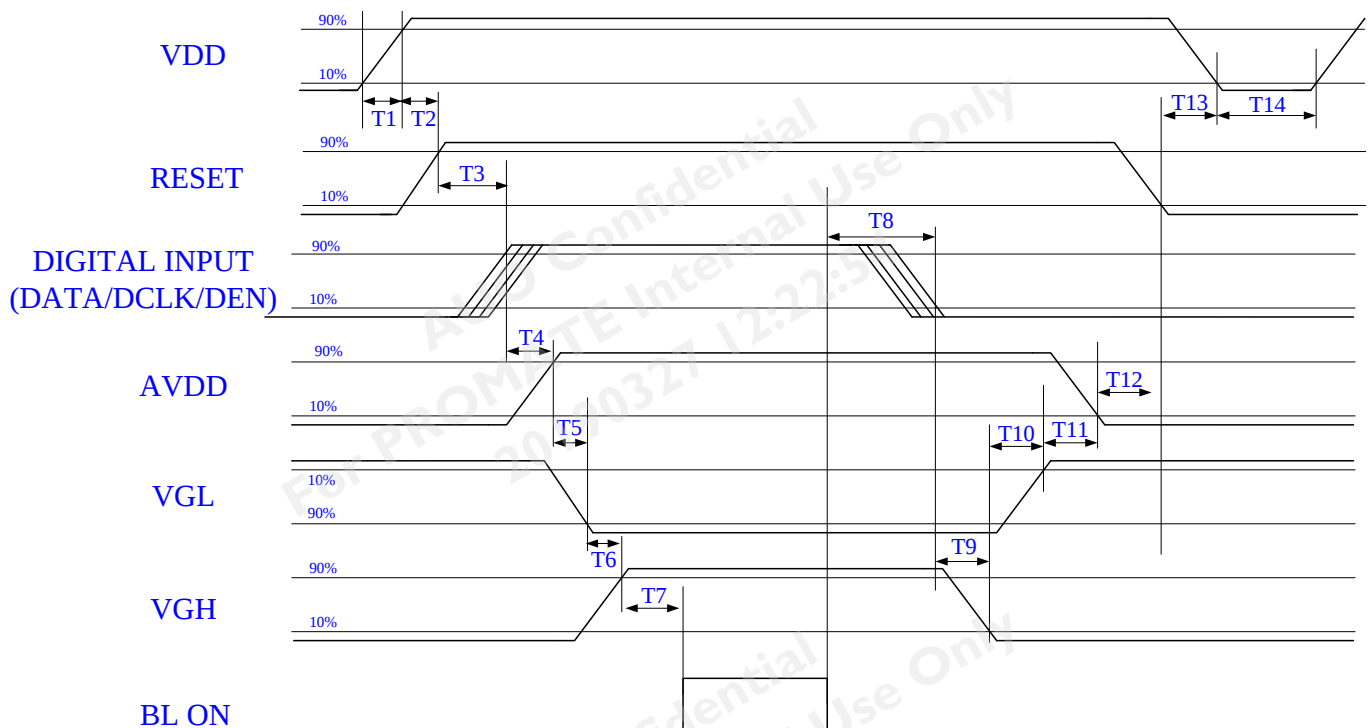
The LCD adopts high voltage driver IC, so it could be permanently damaged under using wrong power on/off sequence procedure. The suggested LCD power on/off sequence is shown as below:

Power on sequence:

VDD → RESET → Digital Input (Data/DCLK/DEN) → AVDD → VGL → VGH → BL ON

Power off sequence:

BL ON → Digital Input (Data/DCLK/DEN) → VGH → VGL → AVDD → RESET → VDD





Parameter	Value			Units
	Min.	Typ.	Max.	
T1	0.5	-	20	ms
T2	1	-	10	ms
T3	10	-	30	ms
T4	0	-	20	ms
T5	10	-	40	ms
T6	10	-	30	ms
T7	100	-	-	ms
T8	100	-	-	ms
T9	10	-	40	ms
T10	0	-	30	ms
T11	0	-	40	ms
T12	10	-	30	ms
T13	1	-	10	ms
T14	1000	-	-	ms

5. Electrical AC Characteristics

a. Input Timing

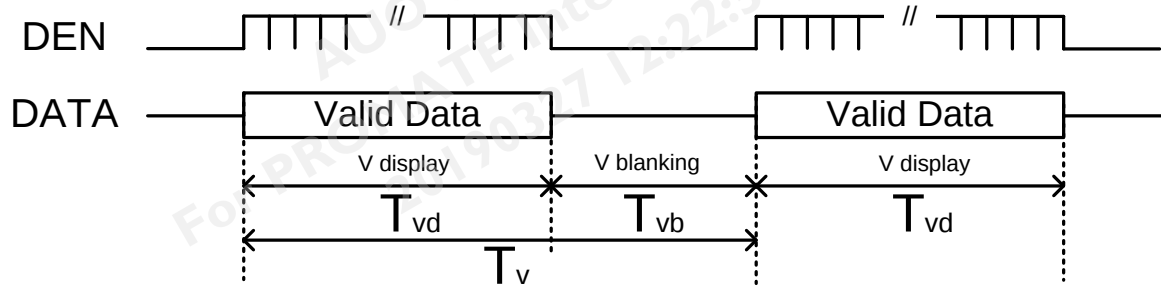
DE MODE

Parameter	Symbol	Min	Typ	Max	Unit
Clock frequency	DCLK	26.4	33.3	46.8	MHz
Frame rate	-	55	60	70	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

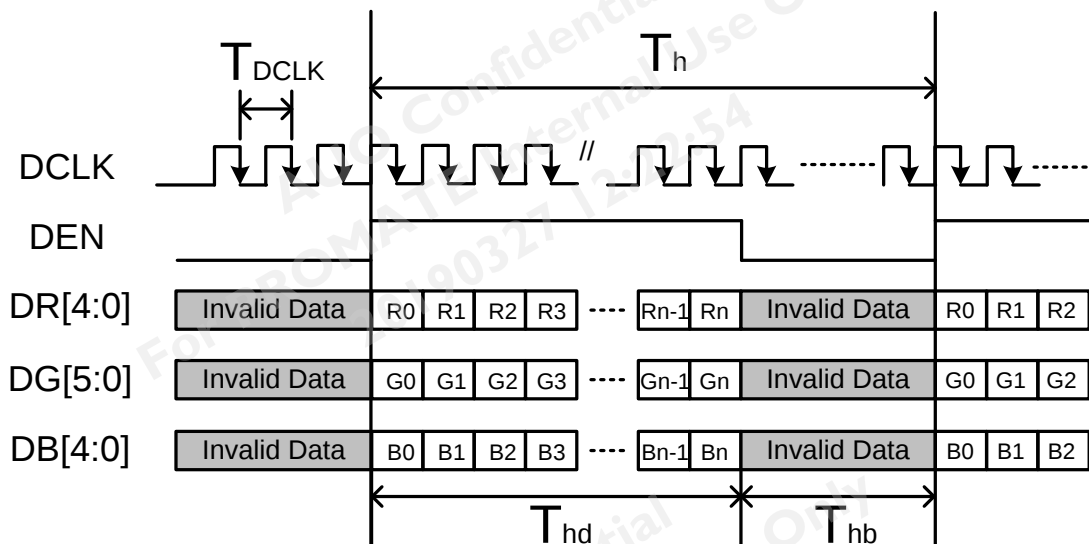
SYNC MODE

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	Twv	3	3	3	TH
Vertical back porch	Tve	32	32	32	TH
Vertical front porch	Tvf	5	13	200	TH

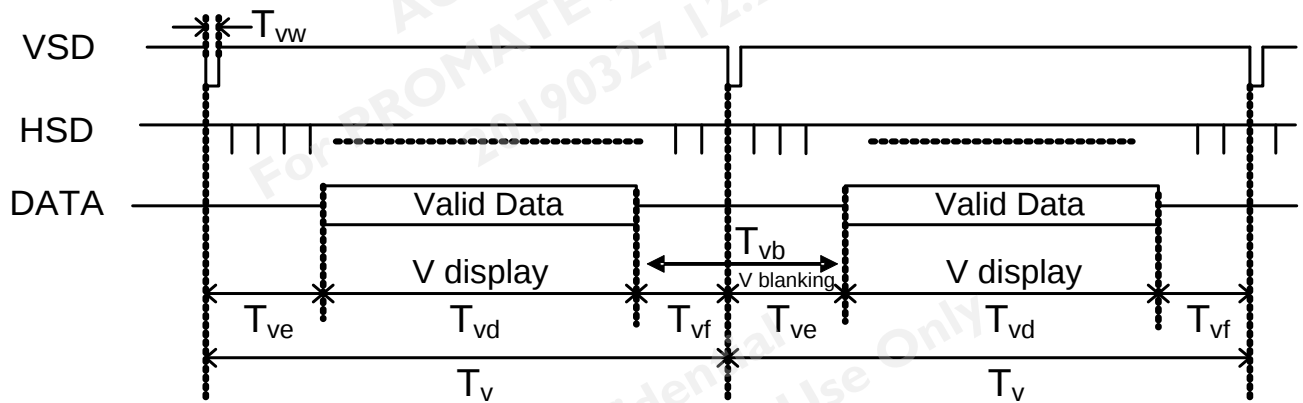
Vertical Timing Input (DE Mode)



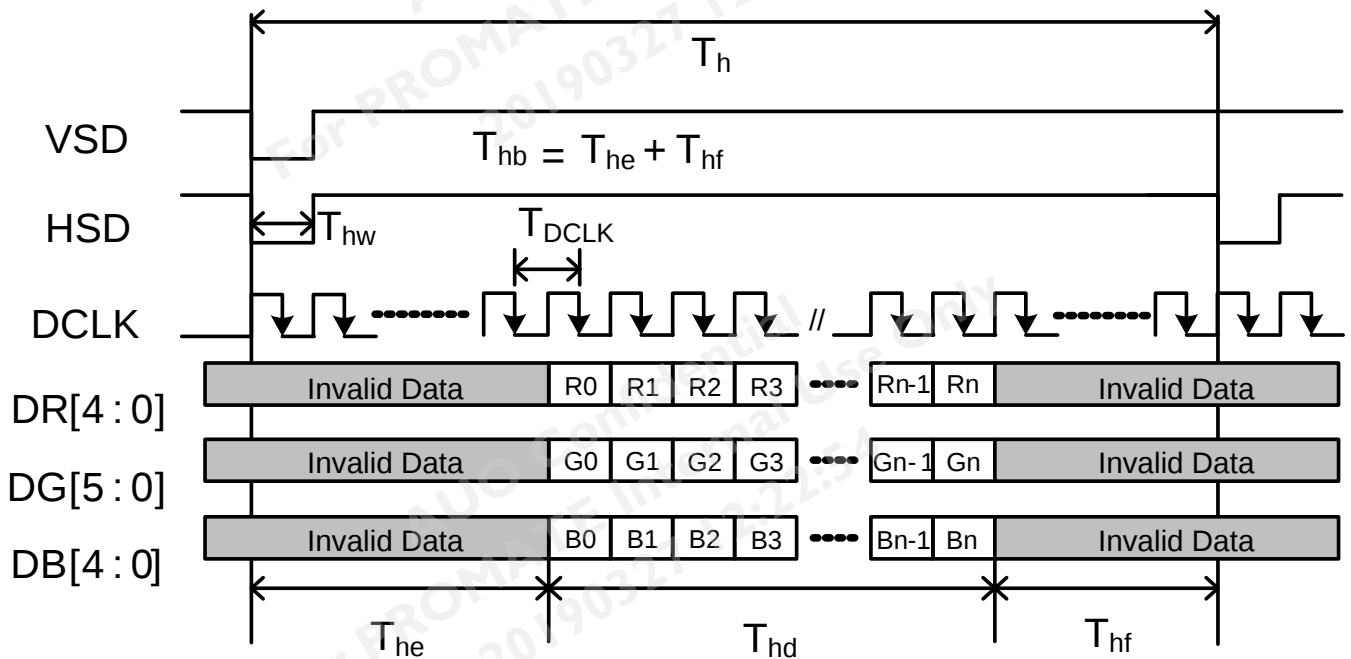
Horizontal Timing Input (DE Mode)



Vertical Timing Input (SYNC Mode)

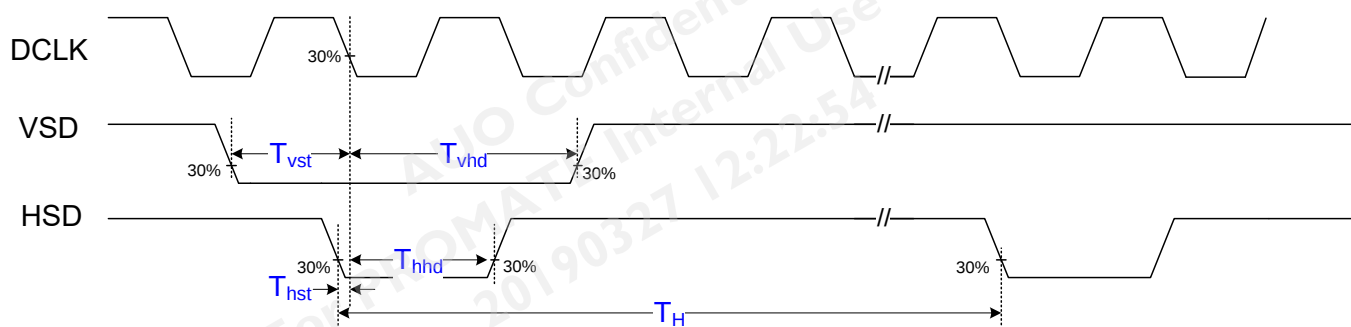
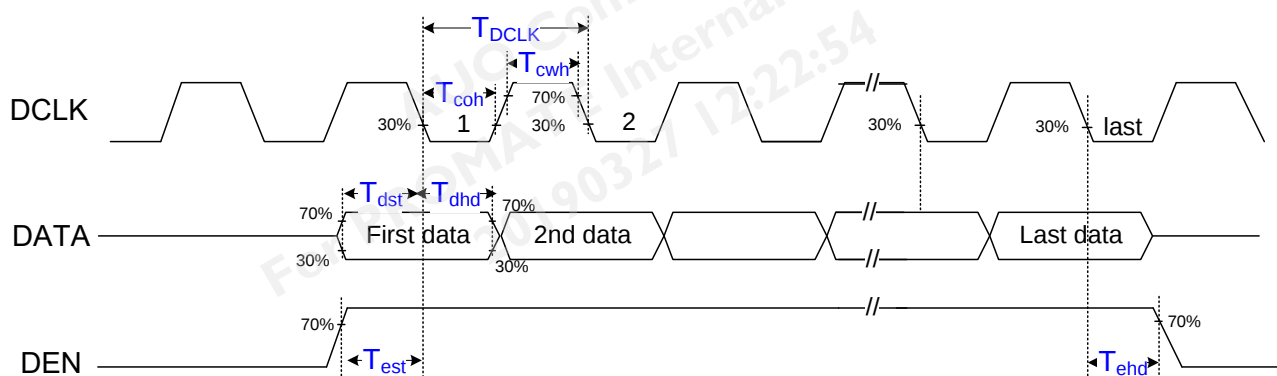


Horizontal Timing Input (SYNC Mode)



b. Signal AC Characteristics

Parameter	Symbol	Min	Typ	Max	Unit
HSD setup time	T_{hst}	8	-	-	ns
HSD hold time	T_{hhd}	8	-	-	ns
VSD setup time	T_{vst}	8	-	-	ns
VSD hold time	T_{vhd}	8	-	-	ns
Data setup time	T_{dst}	8	-	-	ns
Data hold time	T_{dhd}	8	-	-	ns
DEN setup time	T_{est}	8	-	-	ns
DEN hold time	T_{ehd}	8	-	-	ns
DCLK cycle time	T_{coh}	20	-	-	ns
DCLK pulse duty	$Ddclk$	40	50	60	%



D. Optical specifications

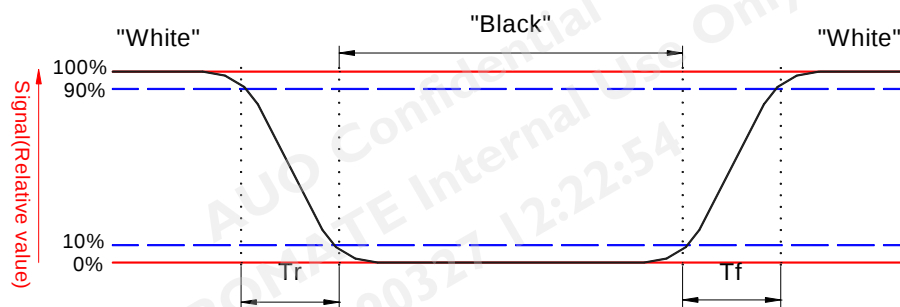
Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time	Tr + Tf	$\theta=0^\circ$	-	25	50	ms	Note 1,2
Contrast ratio	CR	At optimized viewing angle	400	500	-		Note 3
Viewing Angle	Top	CR $\geq$ 10	35	40	-	deg.	Note 4,5
	Bottom		55	60	-		
	Left		55	60	-		
	Right		55	60	-		
Brightness	YL	Perpendicular	1250		-	cd/m ²	Note 6
Chromaticity	Wx	$\theta=0^\circ$	0.263	0.313	0.363		Note 7
	Wv		0.274	0.324	0.374		
Uniformity		-	70	75	-	%	Note 8

*** Optical measurement should be performed in the dark room, ambient temperature =25°C, and backlight current IL=195 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.

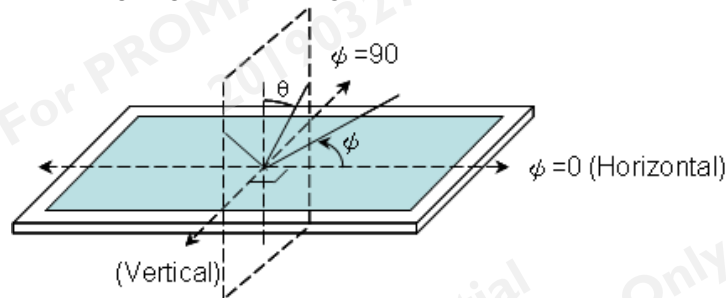


Note 2: From liquid crystal characteristics, response time will become slower and the color of panel will become darker when ambient temperature is below 25°C.

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.



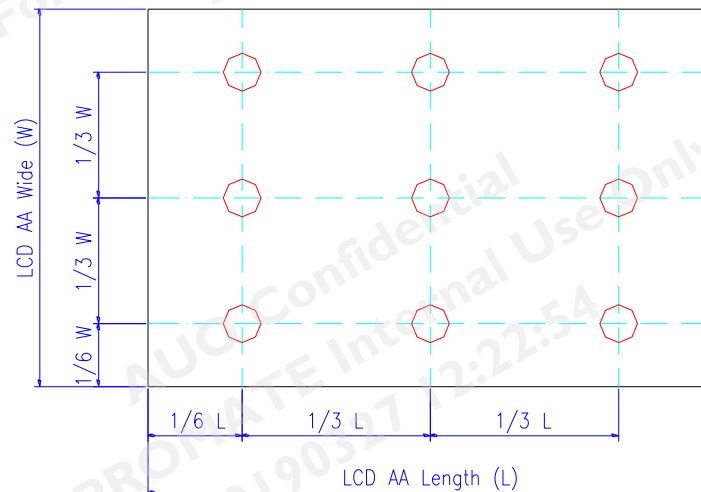
Note 5: The viewing angles are measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

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

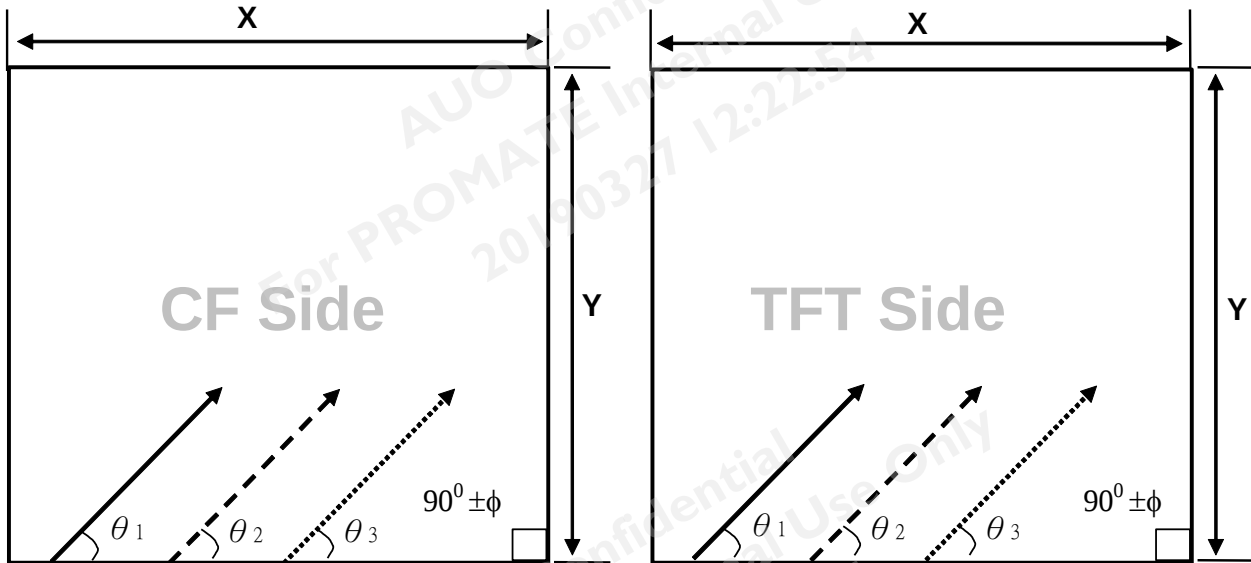
Note 7: The chromaticity of R, G, and B is for reference only. The accurate data will base on the reality test.

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

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



Note 9 : Absorption angle of polarizer



Top view front the protective film

	Absorption Angle
	$\theta_1(^{\circ})$
CF side	45
TFT side	45
Tolerance	± 1

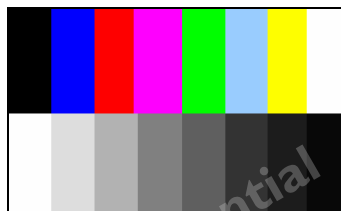
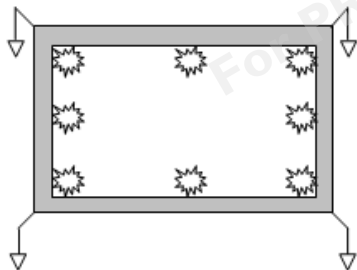
E. Reliability Test Items

No.	Test items	Conditions		Remark
1	High temperature storage	Ta= 80 °C	240Hrs	Note1
2	Low temperature storage	Ta= -30 °C	240Hrs	
3	High temperature operation	Ts= 70 °C	240Hrs	
4	Low temperature operation	Ta= -20 °C	240Hrs	Note1
5	High temperature and high humidity	Ts= 60 °C, 90% RH	240Hrs	Operation
6	Heat shock	-30 °C ~ 80 °C /50 cycles 1Hrs/cycle		Non-operation
7	Electrostatic discharge	Contact Discharge: ± 4KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point Air Discharge: ± 8KV, 150pF(330Ω) 1sec, 8 points, 25 times/ point		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

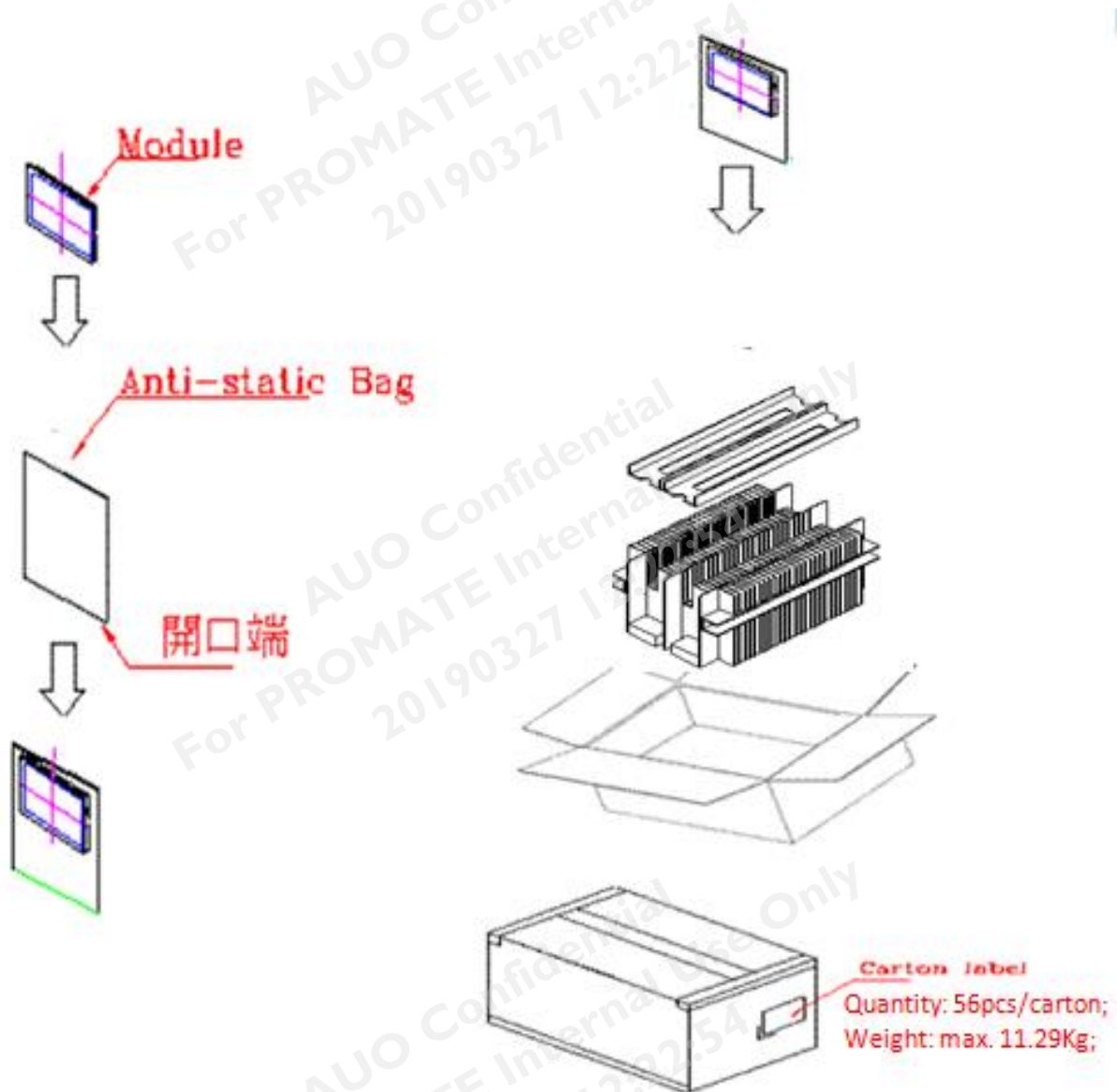
Note 2: In the standard condition, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.

Note 3: According to EN61000-4-2, ESD class B: Some performance degradation allowed. No data lost Self-recoverable. No hardware failures. Test points and pattern as below.



F. 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 2D data matrix code (ECC200) with the following definition:

ABCDEFGHIJKLMNOPQRSTUV A070VTN06

- └─ 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:

270S06ZS3A06V102P80200:

Product Manufacturing Week Code: WK27

Product Version: Version 0

Product Manufacturing Factory: S06

Internal Production Control Number: ZS3A06V102P80200

Product Level: Z

Module Lot Number : S3A06V102P8,

S: Factory side
3A: Production Location
0: Year code (2010)
6V102P8: Lot-Number

Serial Number: 0200

Product Name: A070VTN06

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.