CUSTOMER APPROVAL SHEET

Company Name	
MODEL	**C070VAN02.1**
CUSTOMER APPROVED	Title : Name :

☐ **APPROVAL FOR SPECIFICATIONS ONLY (Spec. Ver. 0.0)**

☐ **APPROVAL FOR SPECIFICATIONS AND ES SAMPLE (Spec. Ver. 0.0)**

☐ **APPROVAL FOR SPECIFICATIONS AND CS SAMPLE (Spec. Ver. 0.0)**

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Total Page	30
Date	2014/07/18

Product Specification

7” COLOR TFT-LCD MODULE

Model Name: C070VAN02.1

Planned Lifetime:

Phase-out Control:

EOL Schedule:

< ◆ >Preliminary Specification

< >Final Specification

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

Record of Revision

Version	Revise Date	Page	Content
0.0	2014/07/18		First Draft.
0.1	2014/08/05	23	Revise white chromaticity

Contents

A. General Description

C070VAN02.1 is an a-Si & transmissive type Thin Film Transistor Liquid crystal Display (TFT-LCD) with AHVA (Advanced Hyper View Angle) 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.

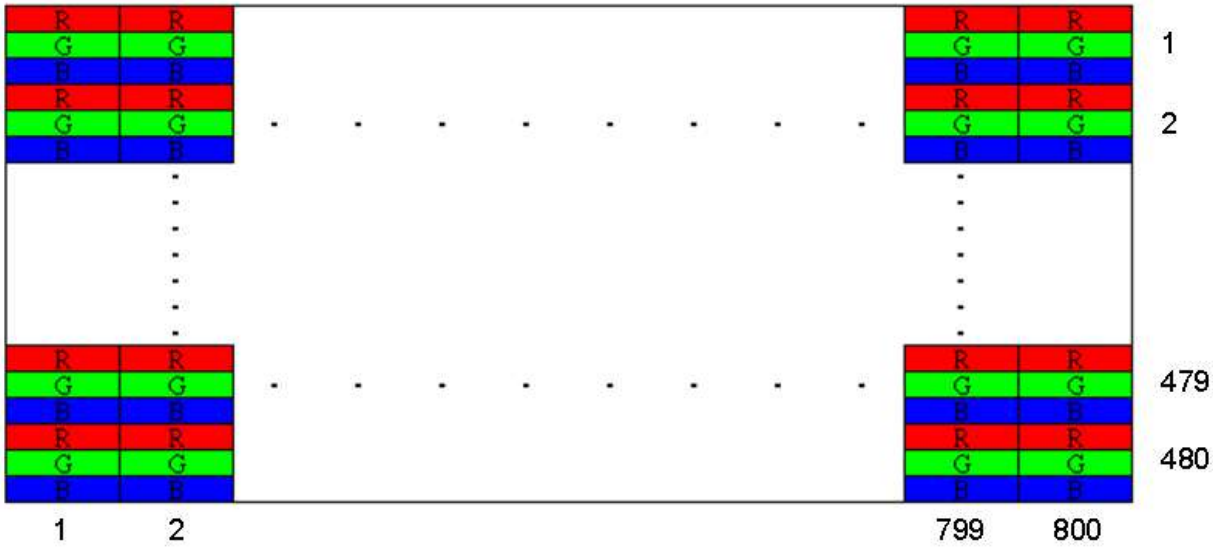
B. Features

- 7-inch (15:9) display
- 800 x 480RGB resolution in RGB horizontal stripe arrangement
- Interfaces: LVDS 8 bit
- Advanced Hyper View Angle – Normal Black wide view technology
- RoHs compliance
- AG surface treatment, 3H Hardness, Reflection rate 5%~6%

C. Physical Specifications

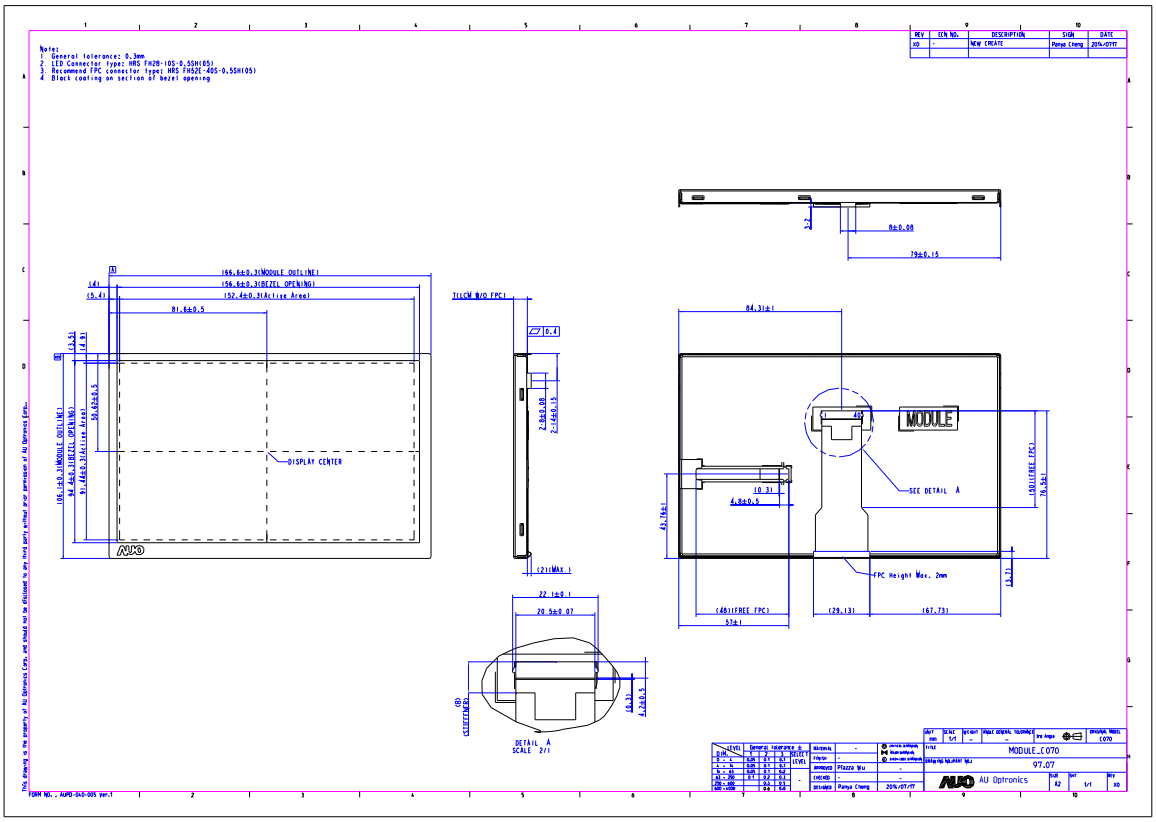
NO.	Item	Unit	Specification	Remark
1	Display Resolution	dot	800 (H)×480 RGB(V)	
2	Active Area	mm	152.4(H)×91.44(V)	
3	Screen Size	inch	7(Diagonal)	
4	Dot Pitch	mm	0.1905(H)x0.0635xRGB(V)	
5	Color Configuration	--	R. G. B. Horizontal Stripe	Note 1
6	Color Depth	--	16.7M Colors	
7	Overall Dimension	mm	166.6(H) × 106.1(V) × 11.9(T)	Note 2
8	Weight	g	180±10%	
9	Display Mode	--	Normally Black	
10	Surface Treatment		AG	

Note 1: Below figure shows horizontal stripe arrangement.



Note 2: including FPC. Please refer to the drawing in page 6 for further information.

D. Outline Dimension



E. Electrical Specifications

1. Pin Assignment

a. Main FPC

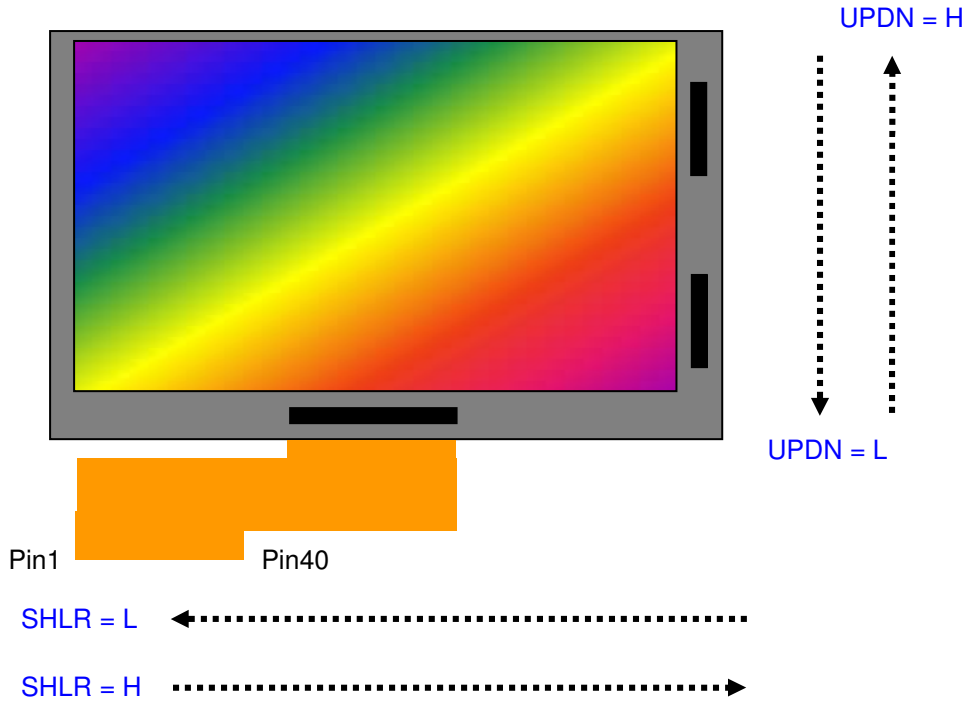
Connector = HIROSE, FH52-40S-0.5SH

No.	Pin Name	I/O	Description	Remarks
1	**NC**	-	No Connect	
2	**SCL**	I	I2C Serial Clock Line. Normally pulled LOW.	Note 1
3	**SDA**	I/O	I2C Serial Data Line. Normally pulled LOW	Note 1
4	**NC**	-	No Connect	
5	**VCOM**	P	Common electrode driving voltage	
6	**UPDN**	I	Vertical scan direction control. "H"→ Down to Up; "L"→ Up to Down	Note 2
7	**SHLR**	I	Horizontal scan direction control. "H"→ Left to Right; "L"→ Right to Left	Note 2
8	**GND**	-	Ground	
9	**AVDD**	P	Power for analog	
10	**AVDD**	P	Power for analog	
11	**NC**	-	No Connect	
12	**VDD**	P	Power for Logic	
13	**GND**	-	Ground	
14	**STBYB**	I	Standby	
15	**RSTB**	I	Reset	
16	**GND**	-	Ground	
17	**CLKP**	I	Positive LVDS differential clock input	
18	**CLKN**	I	Negative LVDS differential clock input	
19	**GND**	-	Ground	
20	**PIND0**	I	Positive LVDS differential data input	
21	**NIND0**	I	Negative LVDS differential data input	
22	**GND**	-	Ground	
23	**PIND1**	I	Positive LVDS differential data input	
24	**NIND1**	I	Negative LVDS differential data input	
25	**GND**	-	Ground	
26	**PIND2**	I	Positive LVDS differential data input	
27	**NIND2**	I	Negative LVDS differential data input	
28	**GND**	-	Ground	
29	**PIND3**	I	Positive LVDS differential data input	
30	**NIND3**	I	Negative LVDS differential data input	
31	**GND**	-	Ground	

32	**VDD**	P	Power for Logic	
33	**VDD**	P	Power for Logic	
34	**NC**	-	No Connect	
35	**VGH**	P	Positive power supply voltage for Gate driver	
36	**NC**	-	No Connect	
37	**VGL**	P	Negative power supply voltage for Gate driver	
38	**NC**	-	No Connect	
39	**VCOM**	P	Common electrode driving voltage	
40	**GND**	-	Ground	

Note 1: SCL and SDA are I2C signals. If I2C is used, please refer to section 3-e ;
if not, please follow the pin setting.

Note 2:



BACK LIGHT UNIT FPC
Connector= HIROSE, FH28-10S-0.5SH

No.	Pin Name	I/O	Description	Remarks
1	Anode	I	Power supply for Backlight	
2	Anode	I	Power supply for Backlight	
3	NC		Not used	
4	NC		Not used	
5	Cathode1	O	Feedback current of channel1	
6	Cathode2	O	Feedback current of channel2	
7	NC		Not used	
8	NC		Not used	
9	THER+	O	Thermal sensor output(+)	
10	THER-	O	Thermal sensor output(-)	

2. Absolute Maximum Ratings

Items	Symbol	Values		Unit	Condition
		Min.	Max.		
Power Supply Voltage	VDD	-0.3	4.5	V	Note 1
Analog Input Voltage	AVDD	-0.5	15	V	Note 1
Gate Driver Voltage	VGH-VGL	-0.3	40	V	
	VGL	-20	0.3		
LED Power Consumption		3.9	5.4	W	
Storage Temperature	T_{ST}	-40	+95	℃	
Operating Temperature	T_{OP}	-30	+85	℃	

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

3. Differential Input Data Format

TBD

4. DC Electrical Characteristics

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

a. Power Specification

Operating Voltage

Parameter	Symbol	Min	Typ.	Max.	Unit	Notes
Power Supply	VDD	3	3.3	3.6	V	
	AVDD	12.5	13	13.5	V	
	VGH	17.5	18	18.5	V	
	VGL	-8.5	-8	-7.5	V	
	VCOM	-	(5.6)	-	V	
Input Signal Voltage	Vref(V1~V9)	0.4*AVDD	-	AVDD-0.3	V	
	Vref(V10~V18)	0.3	-	0.6*AVDD	V	
Input high voltage	Vh	0.7*VDD	-	VDD	V	
Input low voltage	Vl	GND	-	0.3*VDD	V	

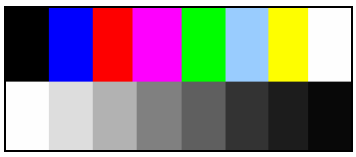
b. Panel Loading

(Tentative)

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Panel current	IVDD	-	(15)	-	mA	Note 1
	IAVDD	-	(27)	-	mA	
	IVGH	-	(0.16)	-	mA	
	IVGL	-	(0.16)	-	mA	
	IVcom	-	(0.01)	-	mA	

*** The limitation range of Minima and Maxima is derived base on operating at ambient temp 25°C
All conditions should be set typical value.
The panel can operate normally in the recommended operating condition.
Need to fine tune the best value from Vcom range for performance.

Note 1 :Typical current test pattern.
Panel loading for power reference.



c. Recommend Gamma 2.2 Voltage

(Tentative)

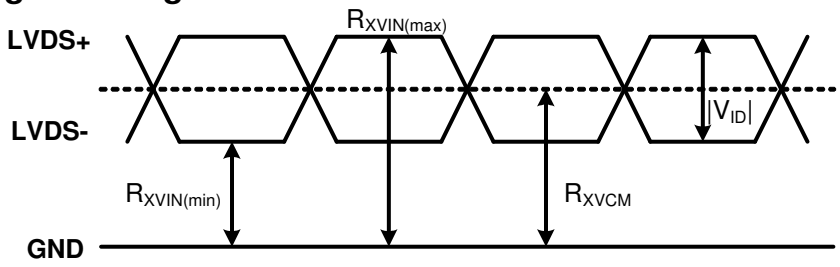
Parameter	Symbol	Min	Typ	Max	Unit	Notes
Gamma Voltage	V1	-	12.42	-	V	
	V2	-	11.75	-	V	
	V3	-	10.20	-	V	
	V4	-	9.64	-	V	
	V5	-	8.95	-	V	
	V6	-	8.48	-	V	
	V7	-	7.96	-	V	
	V8	-	6.97	-	V	
	V9	-	6.75	-	V	
	V10	-	6.11	-	V	
	V11	-	5.83	-	V	
	V12	-	4.85	-	V	
	V13	-	4.32	-	V	
	V14	-	3.85	-	V	
	V15	-	3.16	-	V	
	V16	-	2.60	-	V	
	V17	-	1.05	-	V	
	V18	-	0.62	-	V	

All conditions should be set typical value
The panel can operate normally in the recommended operating condition.
Need to fine tune the best value from Vcom range for performance.
Gamma setting follow the rule of
V1>V2>V3>V4>V5>V6>V7>V8>V9>V10>V11>V12>V13>V14>V15>V16>V17>V18 for normal display.

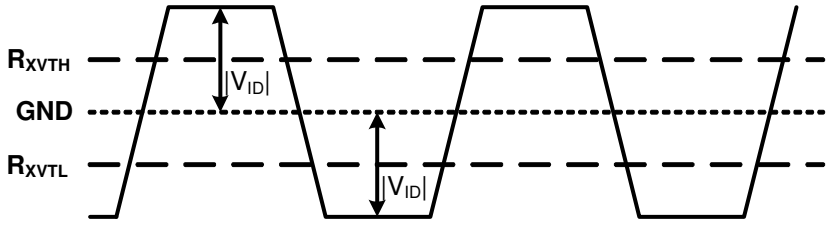
d. Differential Signal DC Electrical Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Notes
Differential input high threshold	R_{XVTH}	200	-	-	mV	R_{XVCM} =1.2V
Differential input low threshold	R_{XVTL}	-	-	-200	mV	R_{XVCM} =1.2V
Input voltage range (singled-end)	R_{XVIN}	0.7	-	1.7	V	
Input differential voltage	$\|V_{ID}\|$	200	-	600	mV	
Differential Input Common Mode Voltage	R_{XVCM}	1.0	1.2	1.4	V	

Single-end Signal



Differential Signal



a. Backlight Driving Conditions (Note 1)

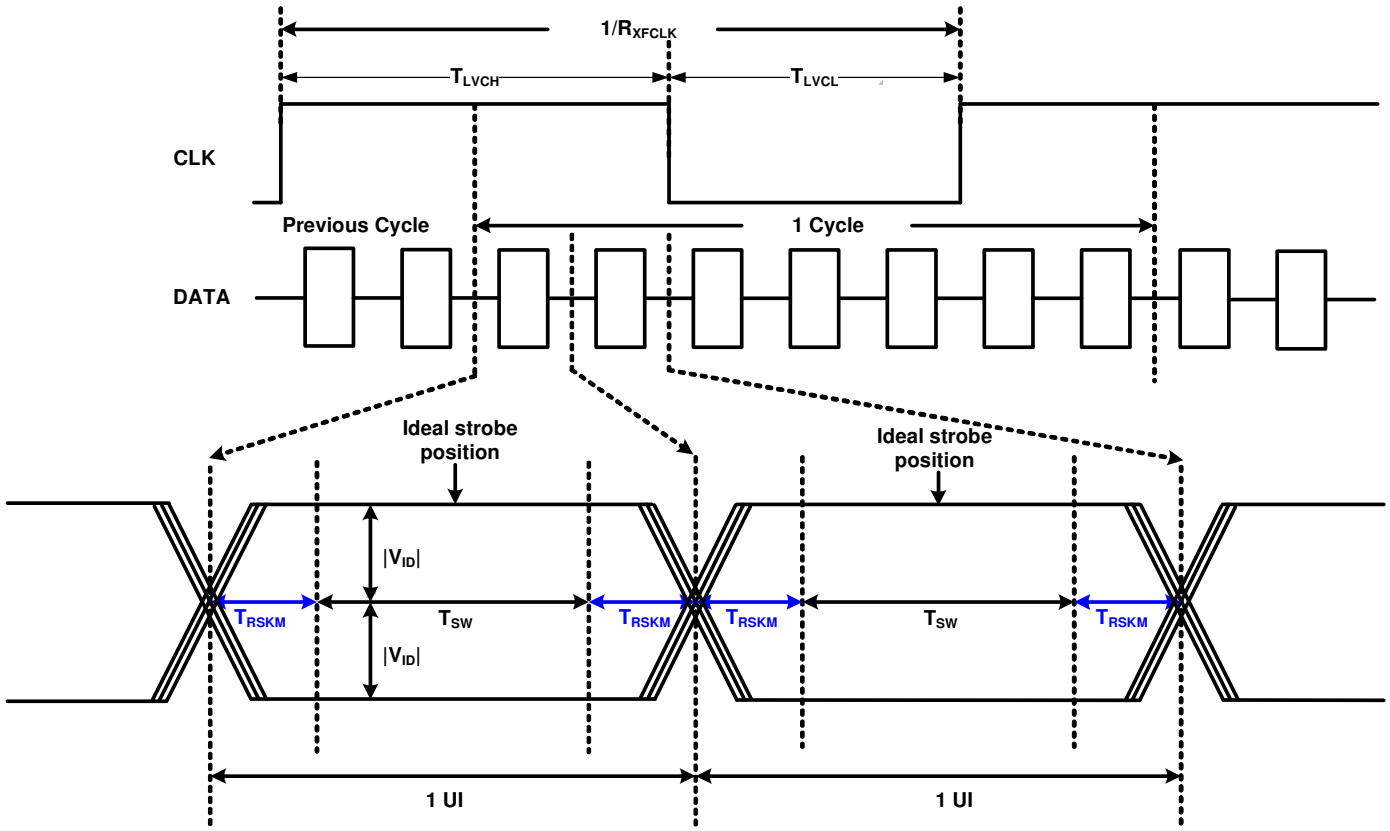
Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
LED Current for Chain	I_F	at 25℃	---	80	---	mA	
Forward Voltage	V_F	I_F=80(mA)	16.2	18	20.4	V	3.4V*6pcs =20.4V (Note 3)
LED Power	P_{LED}		2.592	2.88	3.264	W	Single serial (Note 2)
LED Life Time	T_{LED}	at 25℃	10000	20000	---	Hrs	Note 4

Note 1: LED backlight is 12 LEDs (2strings, 6pcs for each string).
Note 2: The LED supply power is for 2 string of LED
Note 3: Be sure your system can provide enough voltage driving capability (larger than 24V is recommended) to provide 80mA for each LED or the brightness is possible to be below spec.
Note 4: The LED lifetime 10000hrs means, after normal use at 80mA, under +25℃, the brightness of LED decreases to 50% of original level.

3. AC Electrical Characteristics

b. Differential signal AC characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
Clock frequency	R_{XFCLK}	33.2	37.0	40.0	MHz	
Input data skew margin	T_{RSKM}	-	-	1/4	UI	$\|V_{ID}\|$ = 200mV RXVCM = 1.2V
Clock strobe width	T_{SW}	1/2	-	-	UI	
Clock High Time	T_{LVCH}	-	4/(7* R_{XFCLK})	-	us	
Clock Low Time	T_{LVCL}	-	3/(7* R_{XFCLK})	-	us	



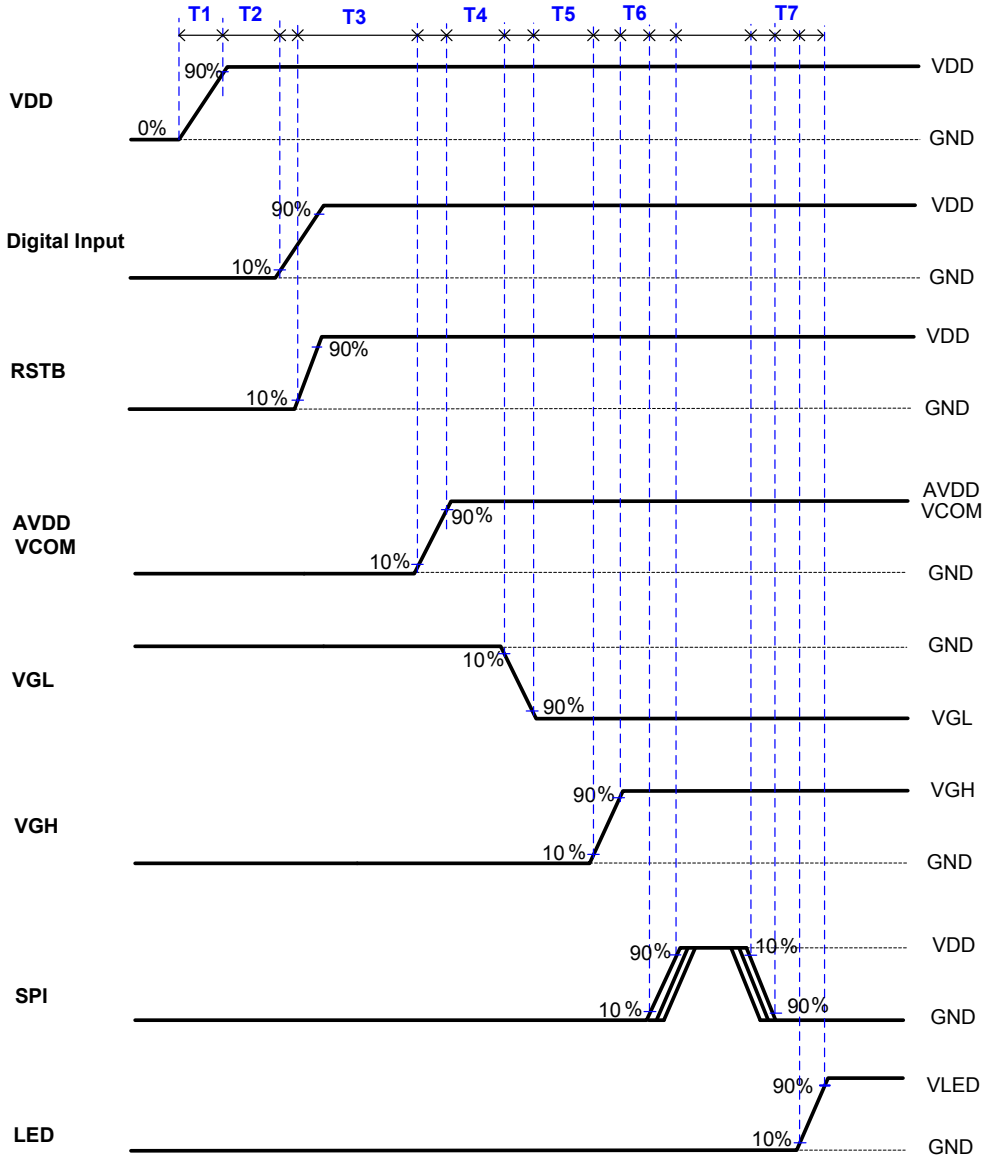
c. Power on/off sequence

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:

Panel Power on sequence:

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	--	--	20	ms
T2	1	--	--	ms
T3	20	--	--	ms
T4	1	--	--	ms
T5	1	--	--	ms
T6	16.7	--	--	ms
T7	50	--	--	ms

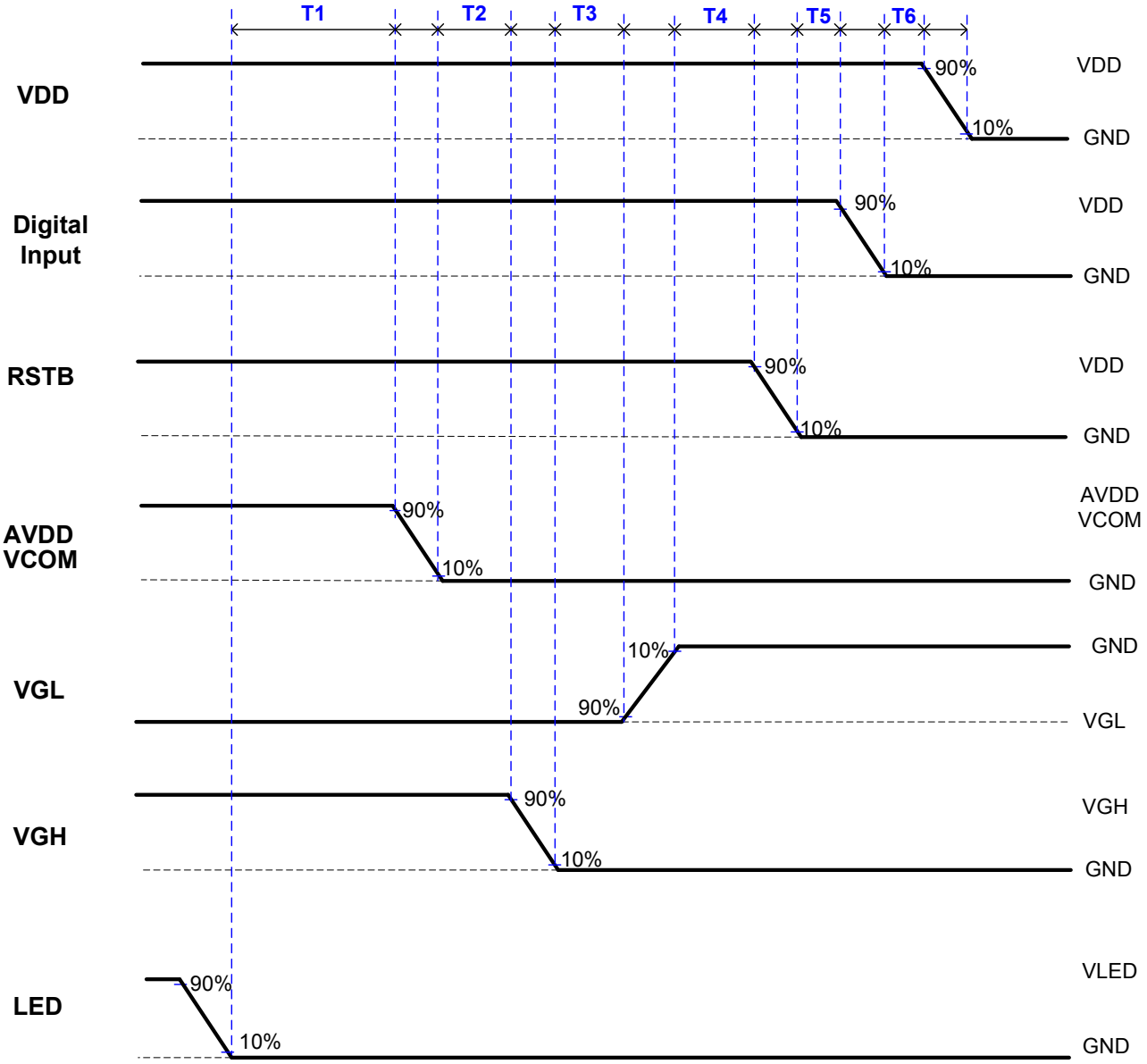
Power on sequence



Panel Power off sequence:

Parameter	Value			Unit
	Min.	Typ.	Max.	
T1	0	--	-	ms
T2	5	--	-	ms
T3	5	--	-	ms
T4	40	--	--	ms
T5	0	--	--	us
T6	0	--	--	us

Power off sequence



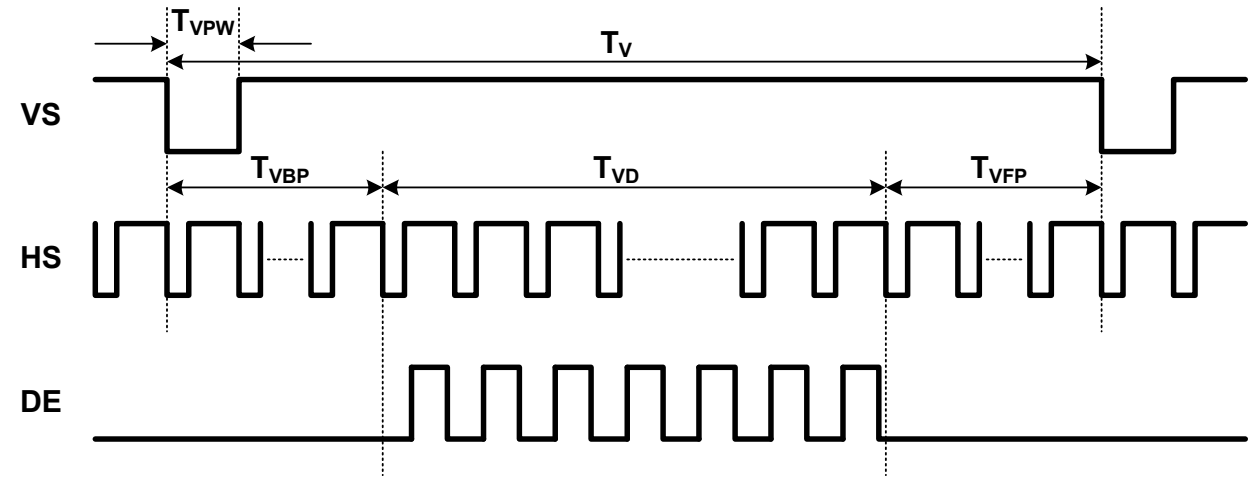
All signal must be discharge to zero voltage when power off.

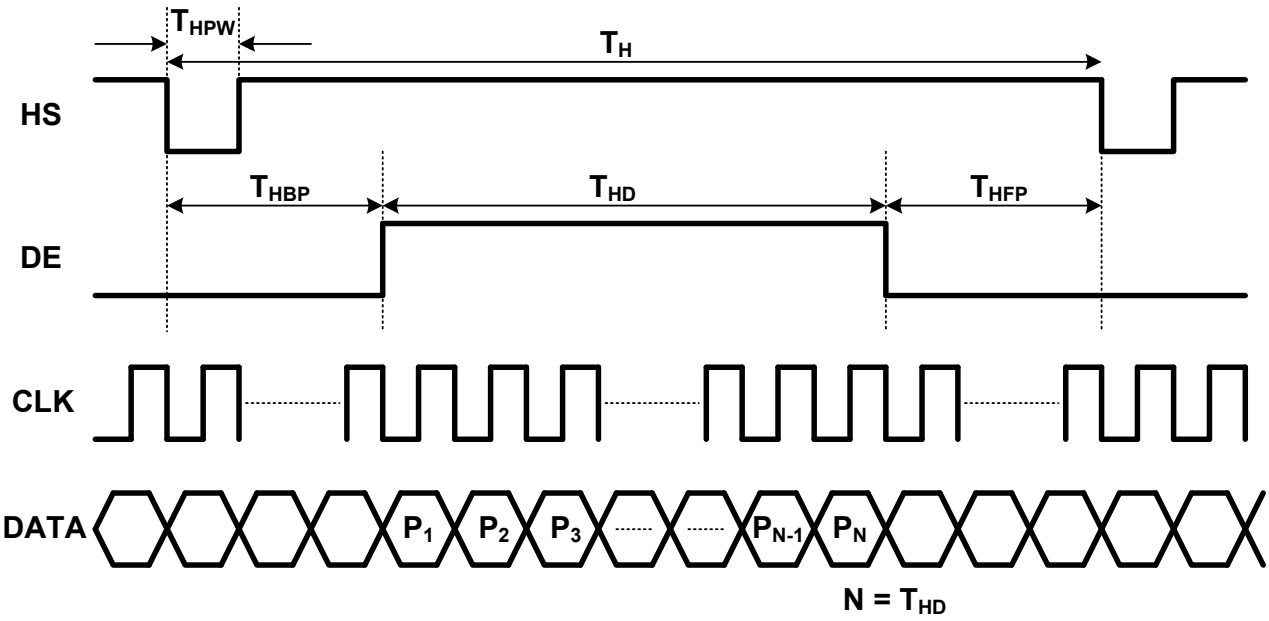
d. Timing Condition

Item	Symbol	Min	Typ	Max	Unit	Remark
Clock frequency	F_{CLK}	33.2	37.0	40.0	MHz	
Vertical display area	T_{VD}		480		H	
Vertical period area	T_V	525	525	530	H	
Vertical blanking area	T_{VB}	45	45	50	H	Note1
Vertical pulse width	T_{VPW}		3		H	
Vertical back porch	T_{VBP}		20		H	
Vertical front porch	T_{VFP}	25	25	30	H	
Horizontal display area	T_{HD}		800		dclk	
Horizontal period area	T_H	1054	1175	1258	dclk	
Horizontal blanking area	T_{HB}	254	375	458	dclk	Note2
Horizontal pulse width	T_{HPW}		3		dclk	
Horizontal back porch	T_{HBP}		48		dclk	
Horizontal front porch	T_{HFP}	206	327	410	dclk	
Data setup time	T_{DS}	6	-	-	ns	
Data hold time	T_{DH}	6	-	-	ns	

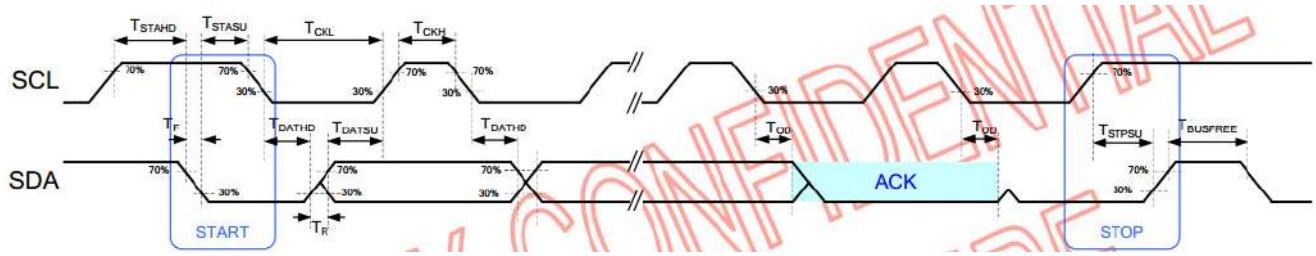
Note1: $T_{VB} = T_V - T_{VD}$
Note2: $T_{HB} = T_H - T_{HD}$

e. Timing Diagram





f. I2C interface AC characteristic

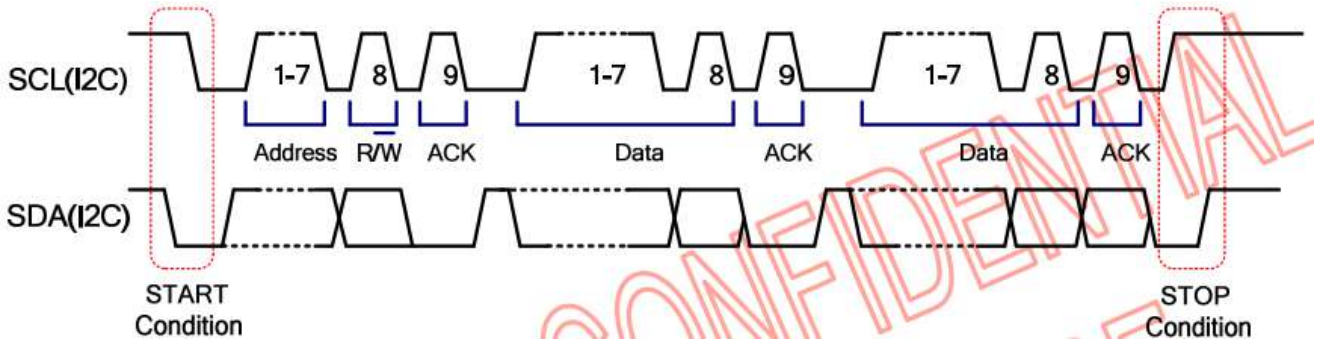


Item	Symbol	Min	Typical	Max	Unit
Working Frequency	F_{CLK}	-	-	400	KHz
Clock Low	T_{CKL}	1200	-	-	ns
Clock High	T_{CKH}	600	-	-	ns
Data Falling Time	T_F	20+0.1 C_b	-	300	ns
Data Rising Time	T_R	20+0.1 C_b	-	300	ns
Data Hold Time	T_{DATHD}	0	-	900	ns
Data Setup Time	T_{DATSU}	100			ns
Start Condition Hold Time	T_{STAHD}	600			ns
Start Condition Setup Time	T_{STASU}	600			ns
Stop Condition Setup Time	T_{STPSU}	600			ns
Bus Free Time	$T_{BUSFREE}$	1200	-	-	ns

Note： C_b = total capacitance of one bus line in pF

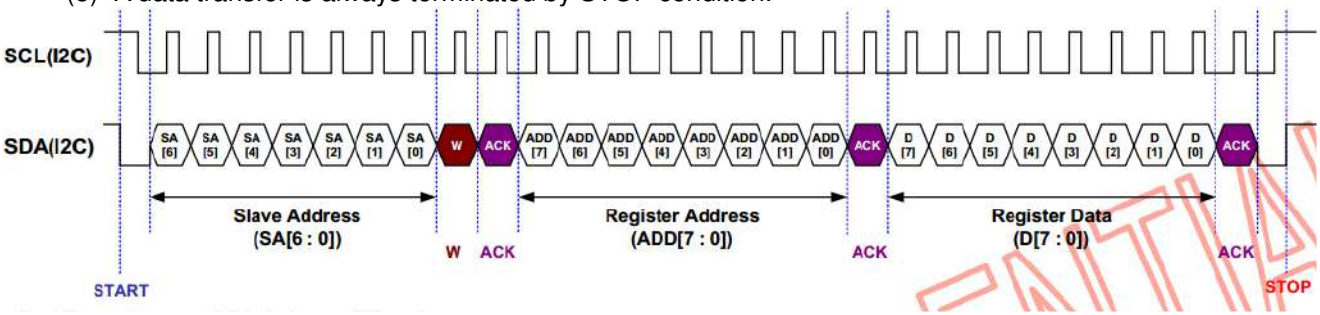
I2C Protocol

MSB															LSB
R/W	**A6**	**A5**	**A4**	**A3**	**A2**	**A1**	**A0**	**D7**	**D6**	**D5**	**D4**	**D3**	**D2**	**D1**	**D0**
R/W	Address							I/O Data							



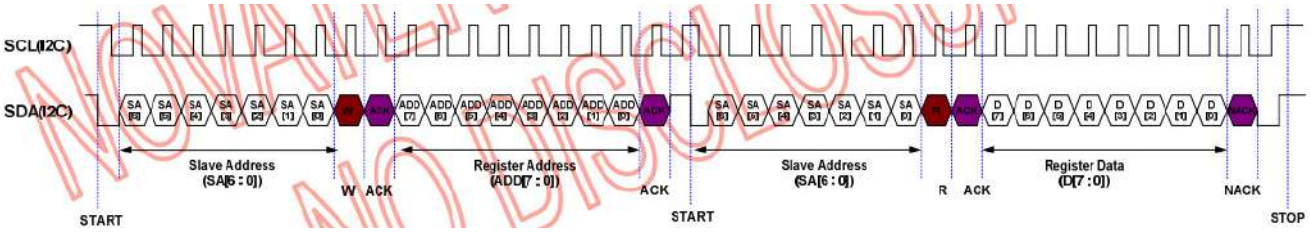
Writing Timing :

(1) Data transfers for register writing follow the format is shown in following figure.
(2) After the START condition, a slave address is sent. R?W bit is setting to “0” for WRITE
(3) The slave issues an ACK to master.
(4) 8 bits register address transfer first then transfer the register data parameter.
(5) A data transfer is always terminated by STOP condition.



Reading Timing :

Note： 1. For write operation, all IC with the same SA[6:0] =6F will receive the data.
2. For read operation, only the IC match SA[6:0]=6F will return the data.



F. Optical specifications (Note 1, 2)

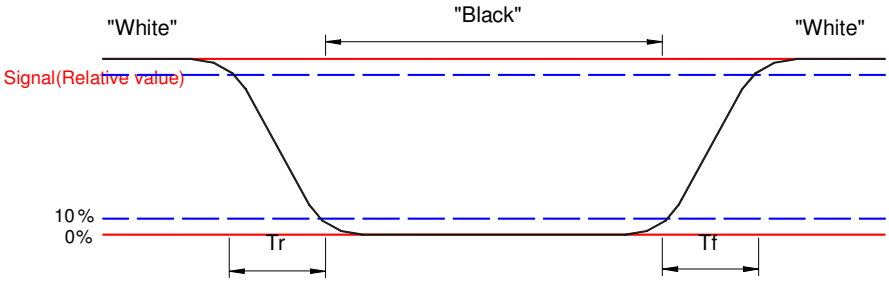
Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time Rise Fall	 Tr Tf	θ =0°	 - -	 15 15	 - -	ms	Note 3
Contrast ratio	CR	θ =0°	800	1000	-		Note 4, 5, 6
Viewing Angle Top Bottom Left Right		CR≧100	 70 70 70 70	 80 80 80 80		deg.	Note 7, 8
Brightness	Y_L	θ =0°	600	750	-	cd/m^2	Note 1,2,9
White Chromaticity	X	θ =0°	(0.254)	(0.294)	(0,334)		Note 8
	Y	θ =0°	(0.288)	(0.328)	(0.368)		
Red Chromaticity	X	θ =0°	(0.605)	(0.645)	(0.685)		
	Y	θ =0°	(0.297)	(0.337)	(0.377)		
Green Chromaticity	X	θ =0°	(0.258)	(0.298)	(0.338)		
	Y	θ =0°	(0.558)	(0.608)	(0.648)		
Blue Chromaticity	X	θ =0°	(0.107)	(0.147)	(0.187)		
	Y	θ =0°	(0.026)	(0.066)	(0.106)		
Uniformity		9-point, θ=0°	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 SR-3, after 10 minutes operation and warm up 30 minutes.

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.



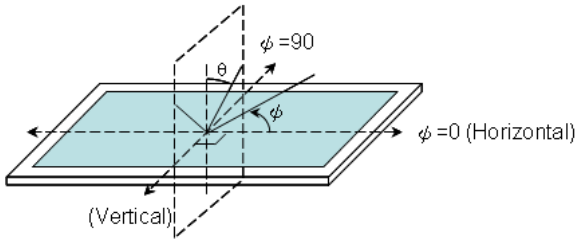
Note 4. From liquid crystal characteristics, response time will become slower and the color of panel will become darker when ambient temperature is below 25℃.

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

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

Note 6. White : RGB data = “11111111” (V1=12.30V , V18=0.68V)
Black : RGB data = “00000000” (V9=7.07V , V10=5.91V)
100% transmission is defined as the transmission of LCD panel when all the inputterminals of Module are electrically opened.

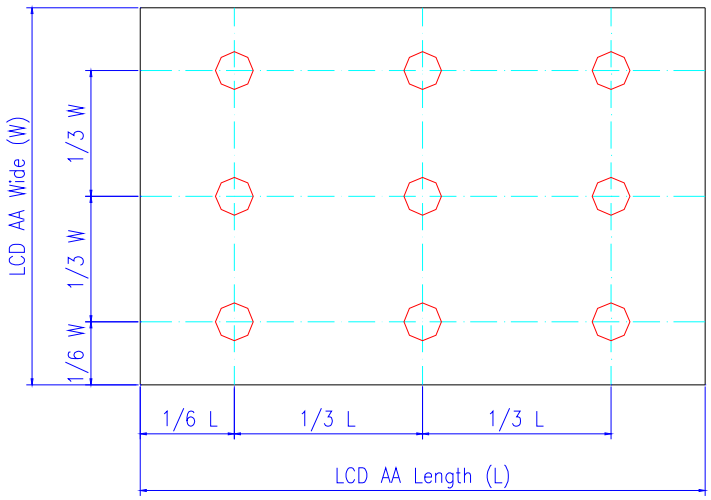
Note 7. Definition of viewing angle: refer to figure as below.



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.
If user finds panel that is out of color range, AUO will proceed to RMA (Return Material Authorisation) Process to exchange panel piece by piece without the failure rate counting.

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

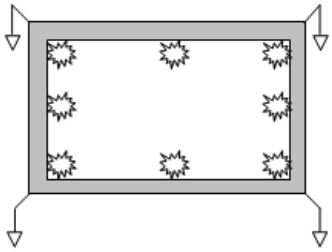
Note 10. Luminance Uniformity is defined as following within the 9 measurements (L1~L9),
Luminance Uniformity(%) =Minimum luminance(brightness)/Maximum luminance(brightness)

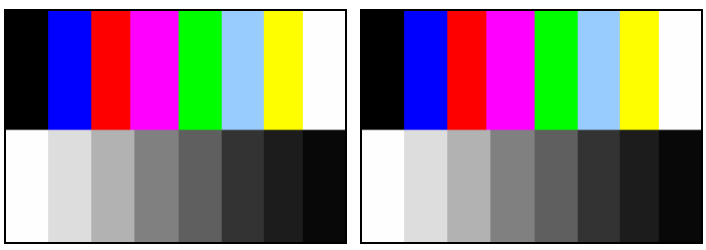


G. Reliability Test Items (Note 2)

No.	Test items	Conditions		Remark
1	High temperature storage	Ta= 95℃	504Hrs	Note1
2	Low temperature storage	Ta= -40℃	504Hrs	
3	High temperature operation	Ta= 85℃	504Hrs	
4	Low temperature operation	Ta= -30℃	504Hrs	Note1, 3
5	High temperature and high humidity	Ta= 60℃, 90% RH	504Hrs	Operation
6	Heat shock	-30℃~85℃/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) 1 times for each point.		Operation (Note 4)
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.
Note 4: Test techniques follow IEC61000-4-2 standard. Test points and pattern as below.





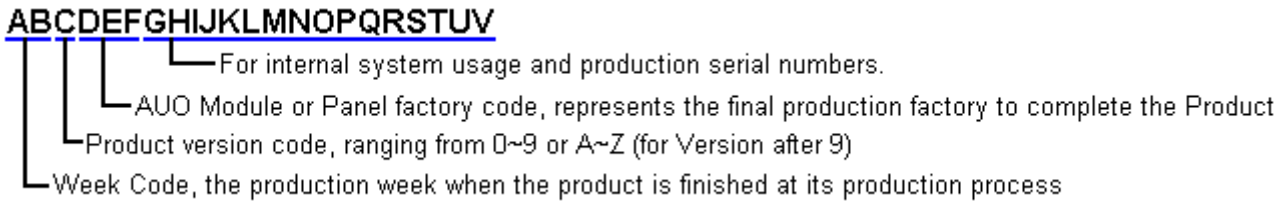
H. Packing and marketing

1. Packing Form

TBD

Module/Panel Label Information

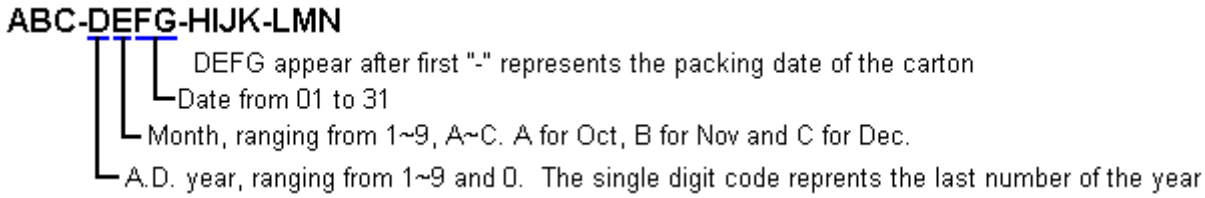
The module/panel (collectively called as the “Product”) will be attached with a label of Shipping Number which represents the identification of the Product at a specific location. Refer to the Product outline drawing for detailed location and size of the label. The label is composed of a 22-digit serial number with the following definition:



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:



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℃ and 35℃ at normal humidity with a period no longer than 3 months as recommended condition.

(b)Keep the temperature at 60℃ 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.

J. Cosmetic Inspection Spec

1. Scope:

The cosmetic inspection standard is applied to the LCM, LCD Module (hereafter referred as the "Modules") supplied by AU Optronics (hereafter referred as "AUO" or the "seller") when inspection is to be performed specifically on the "Module" in buyer's premises, including

1.1 incoming inspection;
1.2 production test;
1.3 final inspection;
1.4 0KM/field returned units;

This cosmetic inspection standard specifies the following contents:

1.5 Lot acceptance criterion and sampling plan when incoming inspection is applicable;
1.6 Inspection setup, including applicable instrument and environment condition;
1.7 Description of defect and criterion;
1.8 Precautions for handling the EPD modules;

The document remains effective within the warranty period of the modules.

2. Incoming inspection:

When incoming inspection is applied to determine the lot acceptance, Paragraph 2, Incoming inspection is to be followed.

2.1 Disposition and Reporting of Incoming Inspection:

The results of the inspection (acceptance or rejection) shall be recorded in writing, and a copy of this written record should be submitted to the seller in adequate format, e.g. e-mails, Fax.

The buyer may, under commercially reasonable reject procedures, reject an entire lot in the delivery involved if such samples of modules within such lot show an unacceptable number of defects in accordance with this cosmetic inspection standards provided, however that the buyer should notify the seller in writing of any such rejection promptly, and no later than within three business days when the inspection incoming is competed.

Should the buyer fails to notify the seller in compliance with the defined procedured in Paragraph 2.1, the buyer's right to reject the modules shall be lapsed and the modules shall be deemed to have been accepted by the buyer.

2.2 Sampling Plan:

Unless otherwise agreed in writing, the sampling plan of incoming inspection shall comply with ANSI/ASQL Z1.4-1993, which determines the acceptance/rejection criterion.

2.2.1 Lot size: Quantity per shipment lot per model.
2.2.2 Sampling type: Normal inspection, single sampling.
2.2.3 Sampling level: Level II.
2.2.4 Acceptable quality level (AQL):
2.2.4.1 Major defect: AQL=0.65 %.
2.2.4.2 Minor defect: AQL=1.00 %.

3.Inspection environment and condition:

3.1 Room temperature: 25±5
3.2 Lighting: Fluorescent light(Day-Light Type) display surface illumination to be 500~1000 Lux.
3.3 Unless otherwise specified, the inspection shall be conducted in perpendicular to the display surface.
3.4 Inspection distance:35±5 cm;
3.5 The module shall be driven in compliance to the driving condition provided by AUO
3.6 The inspection shall be proceeded in an ESD-proected area where the ESD shall be managed to meet the respective AUO Product Specification

4. Classification of defects:

Defects are classified as major defects and minor defects according to the degree of defectiveness defined herein. The definition of defects and respective criteria is only applied to the Active Area. Items outside the Active Area and not affecting the functionality, reliability and mechanical fitting are to be ignored.

4.1 Major defects:

A major defect is a defect that is likely to result in failure, or to reduce theusability of the product for its

intended purpose.

4.1.1 Abnormal Operation: modules cannot display normally, typical abnormal operations may include but not limited to Abnormal Displays, Line Defect and Block Display.

4.1.2 There is serious distortion or sharp burr on mechanical housing.

4.1.3 Glass breakage

4.2 Minor defects:

A minor defect is a defect that is not likely to reduce the usability of the product for its intended purpose and it is typically refers to the cosmetic defects as listed below:

4.2.1 Dot defect:

A.Inspection pattern : Full White, full Black, Full Red,Green and Blue

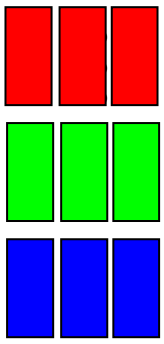
B.Criteria :(acceptable)

Item	Total
Bright dot defect	0
Two adjacent bright dots (vertical, horizontal, oblique, see Note 3)	N≦ 0
Black dot defect	N≦ 3
Two adjacent black dots (vertical, horizontal, oblique, see Note 3)	N≦ 1
Total	N≦ 3

Note:

1. Dot defect is defined as the defective area of the dot area is larger than 50% of the dot area. And the bright dot defect must be visible through 5% ND filter.
2. “N” represents the acceptable number of the dot defect. Each dot defect refers to a “sub-pixel” (a single R, G or B) as Fig. 1.

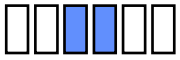
Fig. 1



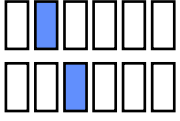
The illustration in Fig. 1 does not represent the actual pixel arrangement.

3. Adjacent dots are measured in “Pair”. See illustration below:

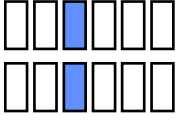
Horizontal adj. dots



Oblique adj. dots

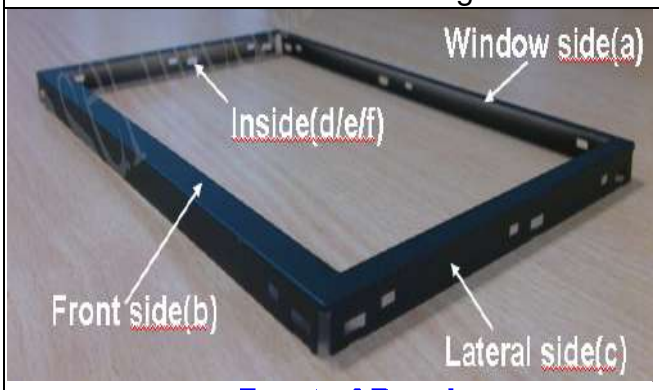


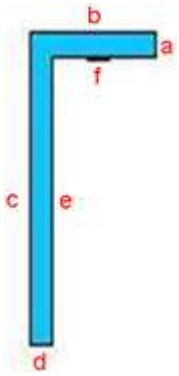
Vertical adj. dots

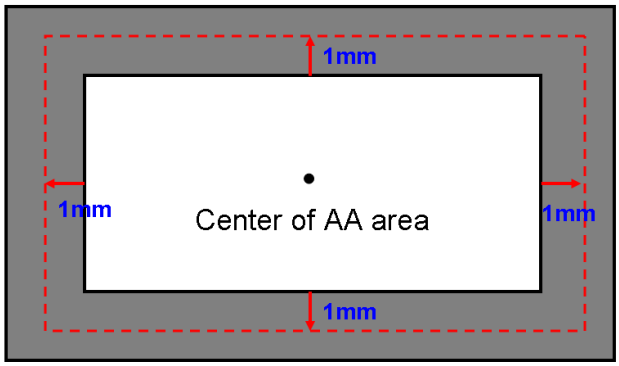


4.2.2 Scratches, dent and extraneous substances: **Dimension measured in mm**

Item			Acceptable criteria
Scratch on the polarizer L : Length W : Width		L ≦ 0.5	Refers to “Dent on the polarizer”
		W ≦ 0.1	Ignore
		0.5 < L ≦ 3.0 0.1 < W ≦ 0.2	N≦4
		0.2 < W	Refers to “Dent on the polarizer”
		3.0 < L, 0.2 < W	None
Dent on the polarizer		D ≦ 0.2	Ignore
		0.2 < D ≦ 0.3	N≦4
		0.3 < D	None
Bubble on the polarizer	Line shape L: Length W:Width	L ≦ 0.5	Refers to “Dot shape”
		W ≦ 0.1	Ignore
		0.5 < L ≦ 3.0 0.1< W ≦ 0.2	N≦4
		0.2 < W	Refers to “Dot shape”
		3.0 < L, 0.2 < W	None
	Dot shape	D ≦ 0.2	Ignore
		0.2 < D ≦ 0.3	N ≦4
		0.3 < D	None
Extraneous substances	Black spots	D ≦ 0.2	Ignore
		0.2 < D ≦ 0.3	N≦4
		0.3 < D	None
	Naps L: Length W:Width	L ≦ 0.5	Refers to “Black spot”
		W ≦ 0.1	Ignore
		0.5 < L ≦ 3.0 0.1 < W ≦ 0.2	N≦4
		0.2 < W	Refers to “Black spot”
		3.0 < L 0.2 < W	None

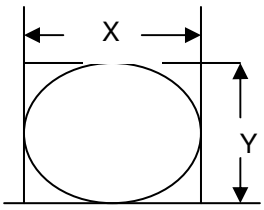
<table>
<tr><th colspan="3">Black Coating Bezel</th></tr>
<tr><th>Area</th><th colspan="2">Criteria</th></tr>
<tr><td rowspan="6">≦1mm from the inner edge to the outer side on front side of bezel(b) + Window side(a)</td><td>The scratch without the metal exposure can be allowed.</td><td>Refers to “Note.7”</td></tr>
<tr><td>ɔec of Granular scratch & Painted Peeling with metal exposure :
n<D≦1.0mm ; N≦8</td><td>Refers to “Note.4”</td></tr>
<tr><td>ɔw side (a) Up / Bottom / Left / Right
angle : <45°</td><td></td></tr>
<tr><td>inside(d/e/f) :
ng defects can be ignored.</td><td></td></tr>
<tr><td>Other cosmetic defects can be ignored.</td><td></td></tr>
<tr><td colspan="2"> 



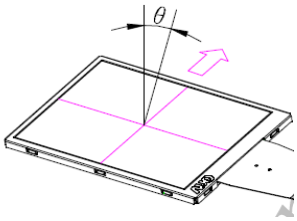
Front of Bezel

</td></tr>
<tr><td>The area out of 1mm on front side(b), lateral side(c) and inside (d/e/f) of the bezel</td><td colspan="2">The cosmetic defects can be ignored.</td></tr>
</table>

Note:
1. Polarizer bubble is defined as the bubble appears on active display area. The defect of polarizer bubble shall be ignored if the polarizer bubble appears on the outside of the active display area.
2. The extraneous substance is defined as it can be observed when the module is power on.
3. If the scratches or damages on the lateral side of bezel or on the appearance of backlight unit do not have the concerns of safety, function display and assembly with the customer’s system set, it can be acceptable.

4. The definition of D, average diameter is defined as follows:
D=(X+Y)/2, where



5. Unless otherwise specified by written document or limit samples, Mura (display un-uniformity) should be inspected under the ND filter by naked eye and shall be accpeted when it is invisible 5% ND filter is applied under the following condition:
   - ND filter to the display surface: 5 cm
   - For Mura: a. brightness of display, typical 650 nit, b. 10 lux. ambient condition.
   - Inspection Patterns: Full black, full white and full gray (50% gray level) pattern
   - Inspection angle: in perpenticular to the display surface



θ <=45°

6. FPC with cosmetic issue, but without functional effect after assembly should be accepted.
7. The viewing line of the black painting bezel should be perpendicular to the surface of the module.

*Note: The module appearance illustrated as the above does not represent the actual module appearanece and is presented as a reference for the definition of inspection angle.

5. Inspection judgement:

The following procedure is applicable when incoming inspection is performed for lot acceptance:

5.1 The judgement of the shipped lot (acceptance or rejection) should follow the sampling plan of ANSI/ASQL Z1.4-1993,single sampling, normal inspection, level II.

5.2 If the number of defects is equal to or less than the applicable acceptance level, the lot shall be accepted.

5.3 If the number of defects is more than the applicable acceptance level, the lot shall be rejected and the buyer should inform the seller of the result of incoming inspection in writing.

6. Precaution:

Please pay attention to the following items when you use the LCD Modules:

6.1 Do not twist or bend the module and prevent the unsuitable external force for display module during

6.2 Adopt measures for good heat radiation. Be sure to use the module with in the specified temperature.

6.3 Avoid dust or oil mist during assembly.

6.4 Follow the correct power sequence while operating. Do not apply the invalid signal, otherwise, it will cause improper shut down and damage the module.

6.5 Less EMI: it will be more safety and less noise.

6.6 Please operate module in suitable temperature. The response time & brightness will drift by different temperature.

6.7 Avoid being displayed the fixed pattern (exclude the white pattern) in a long period, otherwise, it will cause

image sticking.

6.8 Be sure to turn off the power when connecting or disconnecting the circuit.

6.9 Polarizer scratches easily, please handle it carefully.

6.10 Display surface never likes dirt or stains.

6.11 Dew may lead to destruction. Please wipe off any moisture before using module.

6.12 Sudden temperature changes cause condensation, and it will cause polarizer damaged.

6.13 High temperature and humidity may degrade performance. Please do not expose the module to the direct sunlight and so on.

6.14 Acetic acid or chlorine compounds are not friends with TFT display module.

6.15 Static electricity will damage the module, please do not touch the module without any grounded device.

6.16 Do not disassemble and reassemble the module by self.

6.17 Be careful do not touch the rear side directly.

6.18 No strong vibration or shock. It will cause module broken.

6.19 Storage the modules in suitable environment with regular packing.

6.20 Be careful of injury from a broken display module.

6.21 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.