CUSTOMER APPROVAL SHEET

Company Name	
MODEL	C070VW05 V1
CUSTOMER APPROVED	Title : Name :

- ☐ **APPROVAL FOR SPECIFICATIONS ONLY (Spec. Ver.____)**
- ☐ **APPROVAL FOR SPECIFICATIONS AND ES SAMPLE (Spec. Ver.____)**
- ☐ **APPROVAL FOR SPECIFICATIONS AND CS SAMPLE (Spec. Ver.____)**
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Product Specification

7.0" COLOR TFT-LCD MODULE

MODEL NAME: C070VW05 V1

< >Preliminary Specification
< □ >Final Specification

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

Record of Revision

Version	Revise Date	Page	Content
0.0			First Draft
0.1	2009/06/17	5	Update Outline drawing
		7	Update pin assignment of pin49 & pin53
		19	Update Viewing angle Top & Bottom
0.2	2009/07/09	9	Update Absolute Maximum Ratings-- Input voltage VCOM value
		10	Update b.Current Consumption min & Max values
		11	Update c. Backlight driving conditions
0.3	2009/08/05	9	Update Absolute Maximum Ratings--input voltage VCOM min value --Topr & Tstg min & max value --LED Backlight If max value
		10	Update a.Typical operation condition (GND=0)_VCOM value
		11	Update c. Backlight driving conditions--If max value --voltage different value --Note 2 ambient temperature
		18	Update Typical application circuit_Gamma circuit resistance value
		22	Update judgment criteria in Note 2 and Note 3
0.4	2009/09/09	7	Update TFT LCD Panel Pin Assignmen No.44 ,54,56,59
		10	Update b.current consumption(GND=0) Condition of AVDD
0.5	2009/09/21	5	Update B.outline dimension TFT-LCD Module
0.6	2009/10/23	5	Update B.outline dimension TFT-LCD Module
0.7	2009/11/23	24	Update F.Packing and Marking 1.Packing Form
		25	Update F.Packing and Marking 2. Module/Panel Label Information
		26	Update G.Precautions

0.8	2009/12/09	4	Update A.General information: 11.weight , 12panel power consumption 13 backlight power consumption
		10	Update a. Typical Operation Condition (GND = 0V) Power voltage VGL
		19	Update D.Optical specification Brightness min R,G,B typ
0.9	2009/12/17	6	Update C. Electrical Specifications Recommended connector
1.0	2009/12/18	4	Update A.General information: 11.weight , add max remark
		19	Modify D.Optical Specification G(y) typ.
		22	Update E.Reliability Test Item Electrostatic discharge
		23	Update E.Reliability Test Item Note 4 ESD Test Information

Contents

A. General Information

C070VW05 V0 is an a-Si type Thin Film Transistor Liquid crystal Display (TFT-LCD). This model is composed of a TFT-LCD, a driver, an FPC (flexible printed circuit), and a backlight unit.

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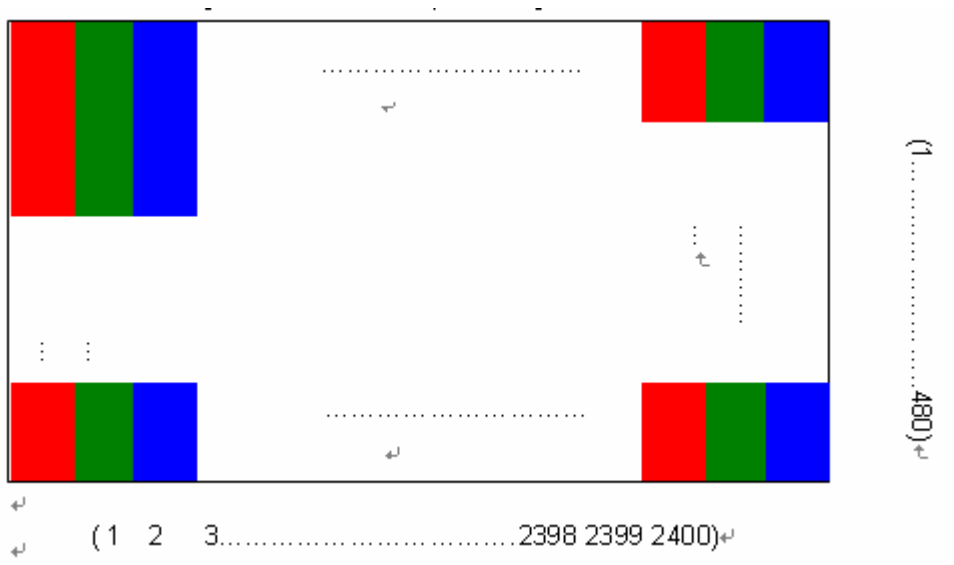
NO.	Item	Unit	Specification	Remark
1	Screen Size	inch	6.99(Diagonal)	
2	Display Resolution	dot	800RGB(H)×480(V)	
3	Overall Dimension	mm	167.0(H)×93.0(V)×7.0(T)	Note 1
4	Active Area	mm	157.2(H)×82.32(V)	
5	Pixel Pitch	mm	0.0655(H)×0.1715(V)	
6	Color Configuration	--	R. G. B. Stripe	Note 2
7	Color Depth	--	262K	
8	NTSC Ratio	%	50	
9	Display Mode	--	Normally White	
10	Panel surface Treatment	--	AG	
11	Weight	g	170	Max.
12	Panel Power Consumption	W	0.497	Note 3
13	Backlight Power Consumption	mW	3.456	
	Viewing direction		12 o'clock (gray inversion)	

Note 1: Not include blacklight cable and FPC. Refer next page to get further information.

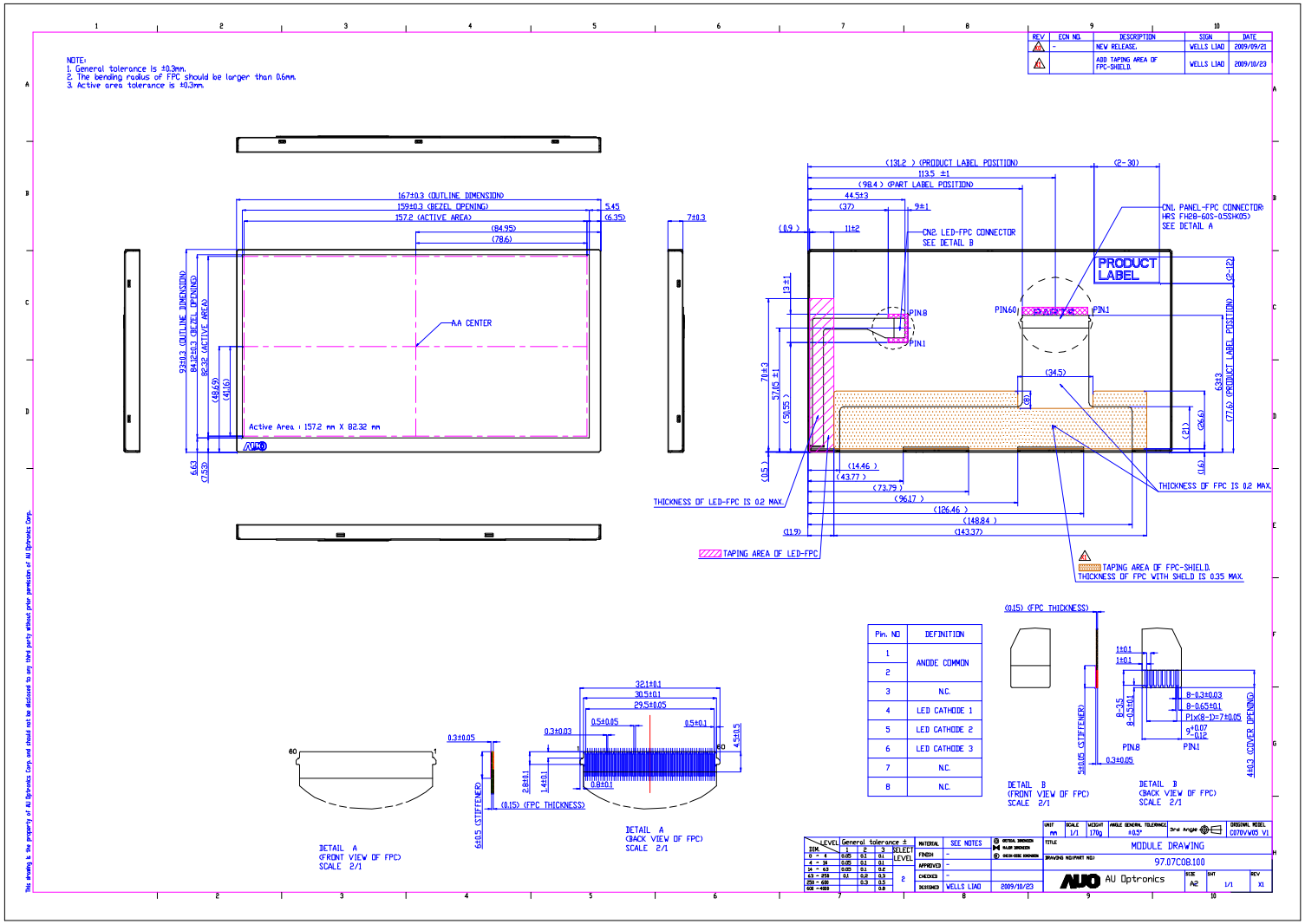
Note 2: Below figure shows dot stripe arrangement.



Note 3: Please refer to Electrical Characteristics chapter.

B. Outline Dimension

TFT-LCD Module



C. Electrical Specifications

1. TFT LCD Panel Pin Assignment

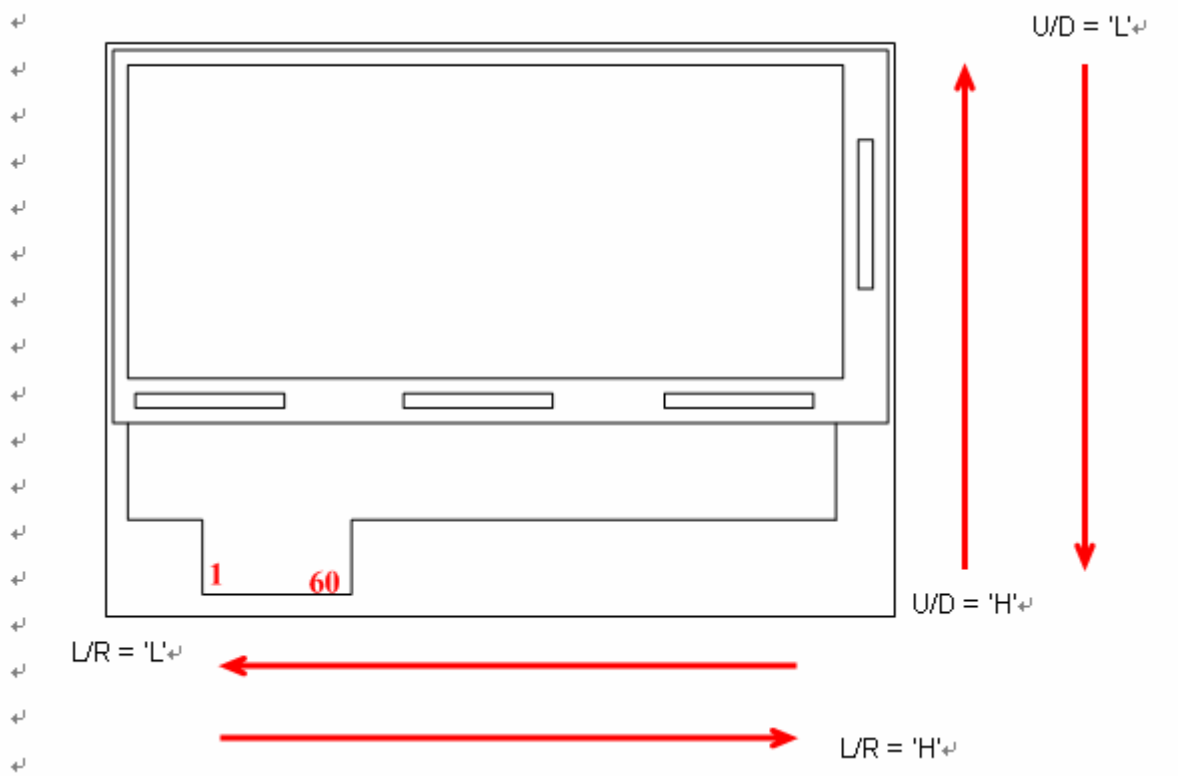
Recommended connector : FH28E-60S-0.5SH

Pin no	Symbol	I/O	Description	Remark
1	GND	G	GND	
2	DIO1	I/O	Horizontal start pulse signal for L2R	**Note 1**
3	LD	I	Load output signal	**Note 2**
4	L/R	I	Left /Right Selection	**Note 1**
5	GND	G	GND	
6	CLK	I	Horizontal shift clock	
7	GND	G	GND	
8	R5	I	Red data (MSB)	
9	R4	I	Red data	
10	R3	I	Red data	
11	R2	I	Red data	
12	R1	I	Red data	
13	R0	I	Red data (LSB)	
14	GND	G	GND	
15	G5	I	Green data (MSB)	
16	G4	I	Green data	
17	G3	I	Green data	
18	G2	I	Green data	
19	G1	I	Green data	
20	G0	I	Green data (LSB)	
21	GND	G	GND	
22	B5	I	Blue data (MSB)	
23	B4	I	Blue data	
24	B3	I	Blue data	
25	B2	I	Blue data	
26	B1	I	Blue data	
27	B0	I	Blue data (LSB)	
28	GND	G	GND	
29	NC	--	No Connection	
30	V1	I	Gamma voltage 1	
31	V2	I	Gamma voltage 2	
32	V3	I	Gamma voltage 3	
33	V4	I	Gamma voltage 4	

34	V5	I	Gamma voltage 5	
35	V6	I	Gamma voltage 6	
36	V7	I	Gamma voltage 7	
37	V8	I	Gamma voltage 8	
38	V9	I	Gamma voltage 9	
39	V10	I	Gamma voltage 10	
40	DIO2	I/O	Horizontal start pulse signal for R2L	**Note 1**
41	REV	I	Data invert control	**Note 4**
42	AVDD	P	Analog power supply for source driver	
43	AVDD	P	Analog power supply for source driver	
44	NC	--	No Connect	
45	DVDD	P	Logic power supply	
46	POL	I	Polarity selection	**Note 3**
47	GND	G	GND	
48	GND	G	GND	
49	STVD	I/O	Vertical start pulse signal for D2U	**Note 1**
50	CKV	I	Shift clock input for gate driver	
51	OE	I	Output enable. The gate driver outputs are disable when OE = “H”.	
52	U/D	I	Up /Down Selection.	**Note 1**
53	STVU	I/O	Vertical start pulse signal for U2D	**Note 1**
54	NC	--	No Connect	
55	VGL	P	Gate off Voltage	
56	NC	--	No Connect	
57	VGH	P	Gate on Voltage	
58	GND	G	GND	
59	NC	--	No Connect	
60	VCOM	I	Common voltage	

I: Input pin; P: Power pin; G: Ground pin; I/O: Input/Output pin

Note 1.



U/D	STVU	STVD	Direction
H	Output	Input	D → U
L	Input	Output	U → D

L/R	DIO1	DIO2	Direction
H	Input	Output	L → R
L	Output	Input	R → L

Note 2. LD

Latches the polarity of outputs and switches the new data to outputs.

1. At the rising edge, latches the “POL” signal to control the polarity of the outputs.

2. The pin also controls the switch of the line registers that switches the new incoming data to outputs.

Note 3. POL

“POL” value is latched at the rising edge of “LD” to control the polarity of the even or odd outputs.

“POL=1” represents that even outputs are of positive polarity with a voltage range from V1 to V5, and odd outputs are of negative polarity with a voltage range from V6 to V10. On the other hand, if LD gets low level “POL”, even outputs are of negative polarity and odd outputs are of positive.

POL=1: Even outputs range from V1 ~ V5, and Odd outputs range from V6 ~ V10

POL=0: Even outputs range from V6 ~ V10, and Odd outputs range from V1 ~ V5

Note 4 REV

Control Whether RGB data are inverted or not. When "REV" = 1 these data will be inverted.

Ex. "00" → " 3F" , "07" → " 38" , and so on. (for TN/VA LC type change)

2. Absolute Maximum Ratings

Item	Symbol	Condition	Min.	Max.	Unit	Remark
Power voltage	VCC	GND=0	-0.3	5.0	V	Digital Power Supply
	AVDD	GND=0	-0.5	12	V	Analog Power Supply Voltage
	VGH	GND=0	-0.3	40	V	Gate On Voltage
	VGL	GND=0	-20	0.3	V	Gate Off Voltage
	VGH - VGL	GND=0	--	40	V	Gate driver supply voltage
Input signal voltage	Vref(V1~V5)	GND=0	0.4AVDD	AVDD+03	V	
	Vref(V6~V10)	GND=0	-0.3	0.6AVDD	V	
Input voltage	VCOM	GND=0	(-0.3)	(4.4)	V	VCOM DC Voltage
Operating Temperature	Topr		-30	85		℃
Storage Temperature	Tstg		-40	95		℃
LED Backlight	If			100		mA

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 DC Characteristics

a. Typical Operation Condition (GND = 0V)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power Voltage		VCC	3.0	3.3	3.6	V	Digital Power Supply
		AVDD	9	9.8	10.6	V	Analog Power Supply
		VGH	17.5	19	20.5	V	Positive power supply for gate driver
		VGL	-10	-9	-8	V	Negative power supply for gate driver
Output Signal Voltage	H Level	VOH	VDD-0.4	--	--	V	DIO1, DIO2, IOH=1mA,
	L Level	VOL	GND	--	GND+0.4	V	DIO1, DIO2, IOL=-1mA
Input Signal Voltage	H Level	VIH	0.7xVDD	--	VDD	V	
	L Level	VIL	GND	--	0.3xVDD	V	
Gamma reference voltage		V1~V5	0.4AVDD	--	AVDD-0.1	V	Note 1
		V6~V10	0.1	--	0.6AVDD	V	
Vcom		VCOM	3.1	3.6	4.1	V	

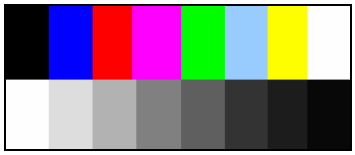
Note 1: Gamma suggested circuit: refer to 6. Application Notes (p.17)

b. Current Consumption (GND=0V)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Input Current for VCC	IVCC	VCC=3.3V	(2.5)	--	(5.2)	mA	Note 1, 2
Input Current for Driver	IVGH	VGH=19V	(160)		(225)	uA	
	IVGL	VGL=-8V	(170)		(240)	uA	
	IAVDD	AVDD=9.8V	(18)		(37)	mA	

Note 1:Test Condition is under typical Eletrical DC and AC characteristics.

Note 2: Test pattern is the following picture.



Note 3:In standby mode, all digital signals are stopped. Ex. DCLK, HSYNC ..etc.

c. Backlight Driving Conditions

The backlight (LED module, Note 1) is suggested to drive by constant volatage with typical value.

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Supply Current	I_L		80	85	mA	Single serial Note1
LED Supply Voltage	V_f	-	14.4	16	V	Note 2
Voltage different	ΔVf	-		0.8	V	Note 2
LED Life Time		10000			Hr	Note 3

Note 1: LED backlight is 12 LEDs (3 strings, 4pcs for each string).

Note 2: The "Voltage difference" is defined as the difference in Vf of each string in backlight (3 strings) at Ta=25℃

Note 3: LED Lifetime is definition: brightness is decreased to 50% of the initial value. LED Lifetime is restricted under normal condition, ambient temperature = 25℃ and LED operating IL = 80mA.

4. Electrical AC Characteristics

a. Signal AC Characteristics

Characteristics (VCC=3.3V, AVDD=9.9V, GND=0V, TA=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit
CLK frequency	Fclk	27	33	40	MHz
CLK pulse width	Tcw	40%	--	60%	Tcph
Data set-up time	Tsu	4	--	--	ns
Data hold time	Thd	2	--	--	ns
Propagation delay of DIO2/1	Tphl	6	10	15	ns
Time for the last data to LD	Tld	1	--	--	Tcph
Pulse width of LD	Twld	2	--	--	Tcph
Time for LD to DIO1/2	Tlds	5	--	--	Tcph
POL set-up time	Tpsu	6	--	--	ns
POL hold time	Tphd	6	--	--	ns
Output stable time	Tst	--	--	12	us
CKV Pulse Width	Tckv	500			ns
STVD/STVU Setup Time	Tsuv	200			ns
STVD/STVU Hold Time	Thdv	300			ns
STVD/STVU width (Note.1)	Tstv	-	1	-	Tpckv
Charging time1 (Note.2)	Tch1	20			us
Charging time2 (Note.2)	Tch2	20			us
OEV Pulse Width	Twcl	1			us
OEV cover CKV time1 (Note.5)	TOEV1	1			Tcph
OEV cover CKV time2 (Note.5)	TOEV2	1			Tcph

Time CKV rising to LD falling (Note.4)	TCTL	2			us
Time OEV rising to LD falling (Note.4)	TOTL	2			us

.

Note.1: Pulse width of STV(R/L) should be set 1 Tpckv (Time period of CKV).

Note.2: If OEV is used, charging time must be followed to Tch1 setting, at least 20 us.
Otherwise, if OEV is unused, charging time must be followed to Tch2 setting, at least 20 us.

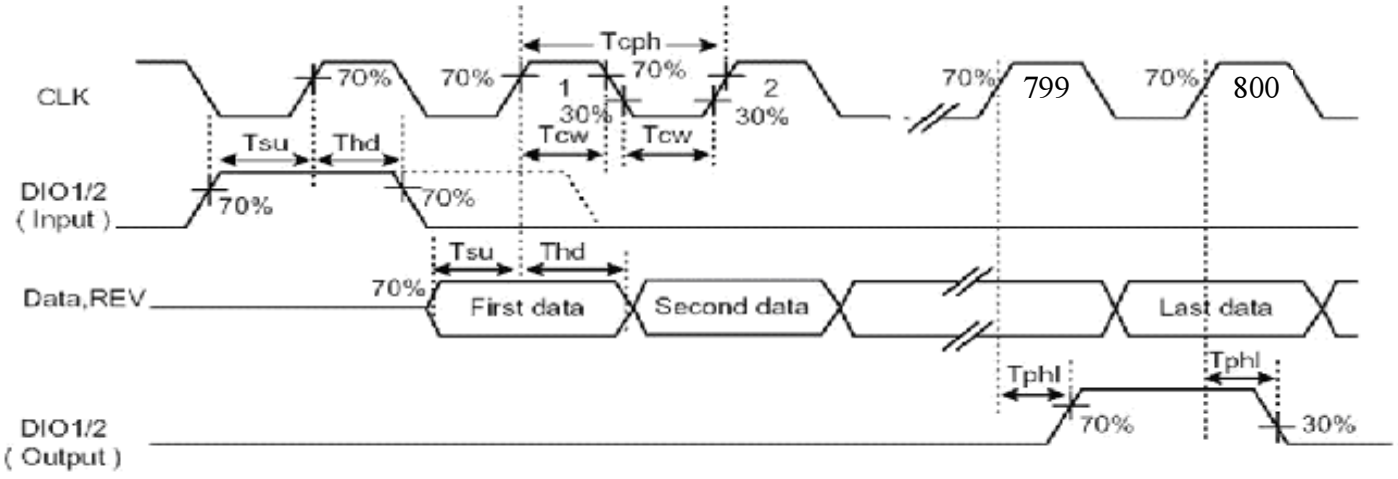
Note.3: The panel is designed to prevent the current leakage for the best display performance. If shorter discharge time is desired when system power off, then extra discharge circuit may be required at customer's side

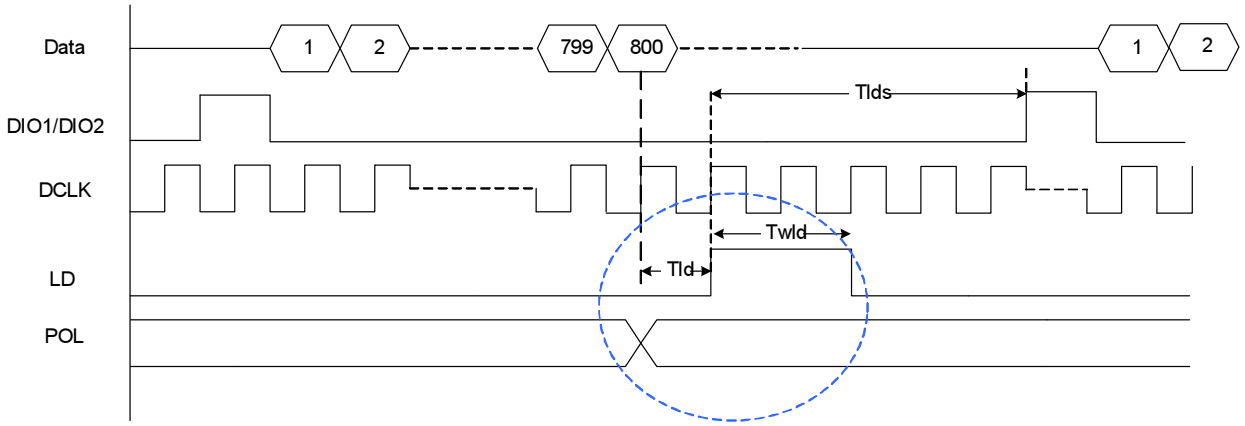
Note.4: If OEV is used, TOTL(time from OEV rising edge to LD falling edge) should be set more than 2us to prevent panel from displaying wrong data.
If OEV is unused, TCTL(time from CKV rising edge to LD falling edge) should be set more than 2us to prevent panel from displaying wrong data.

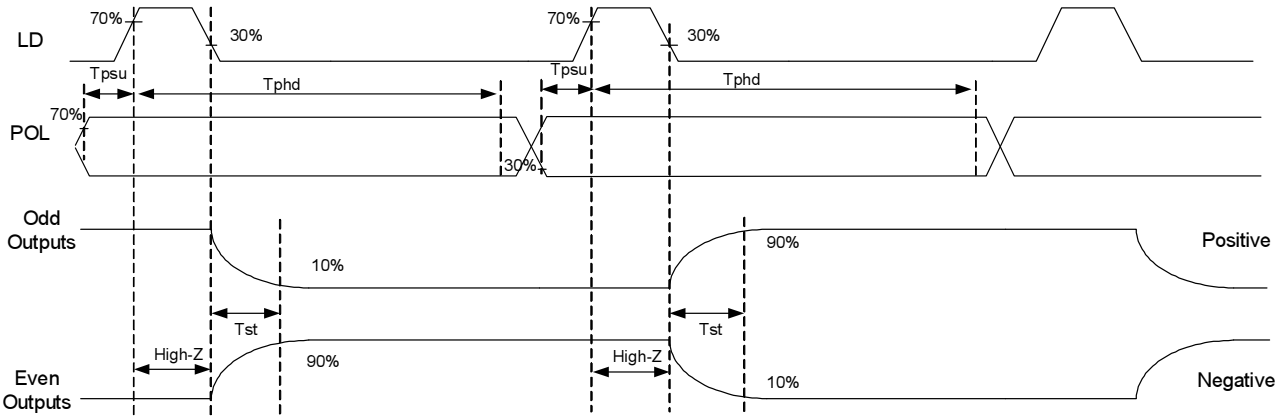
Note.5: If OEV is used, pulse of OEV must cover the rising area of CKV. Therefore, TOEV1 and TOEV2 must be more than 1 Tcph.

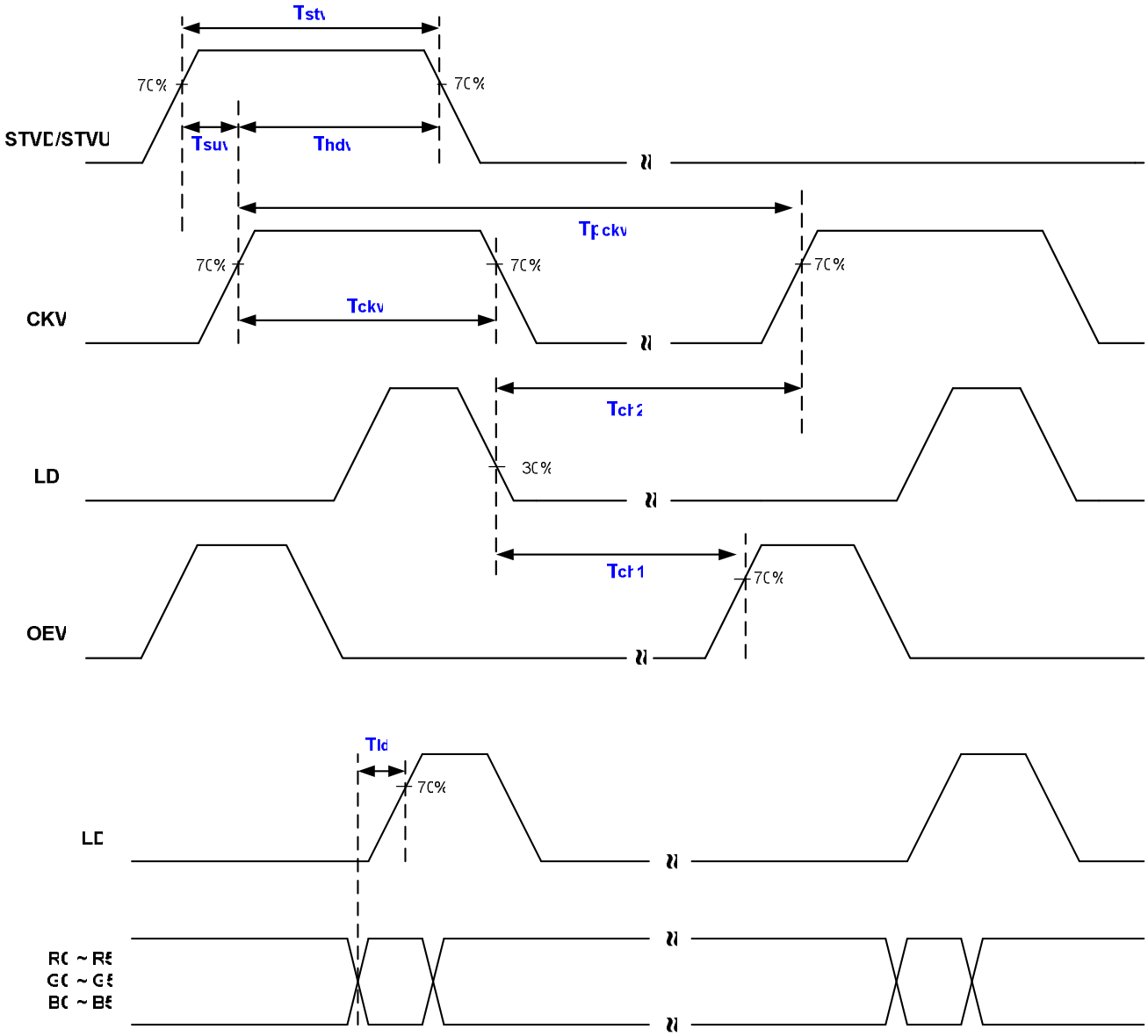
b. Input Timing

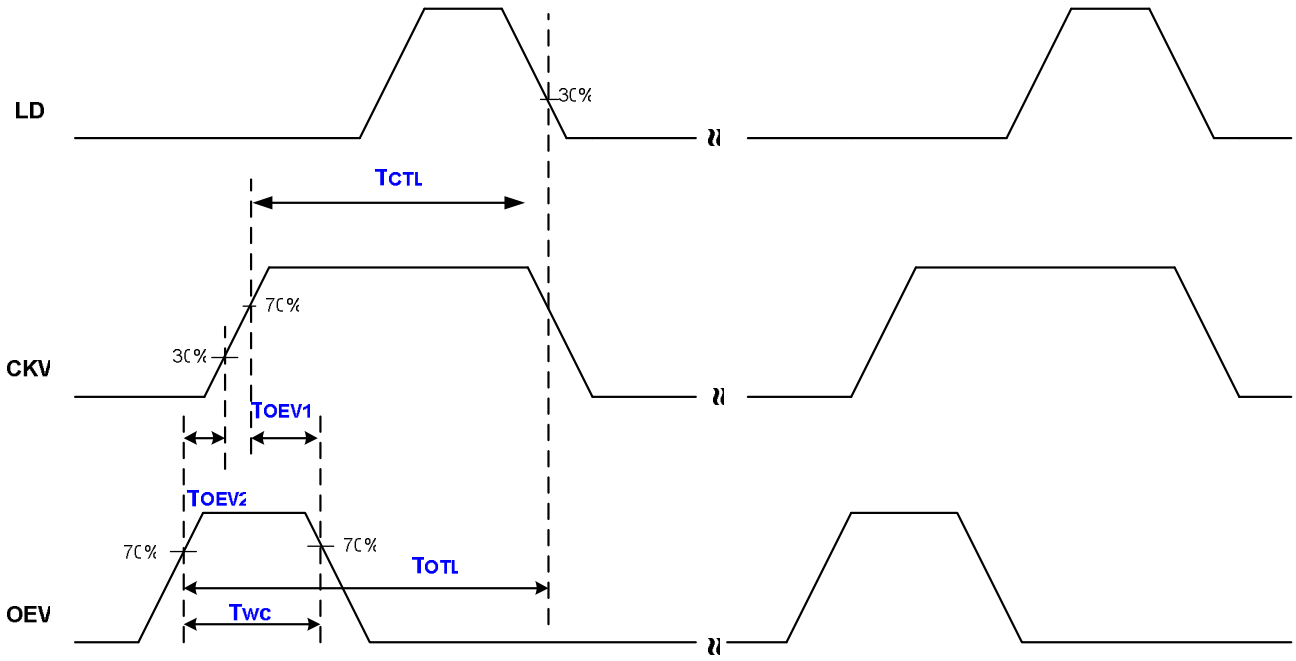
Horizontal Timing Diagram



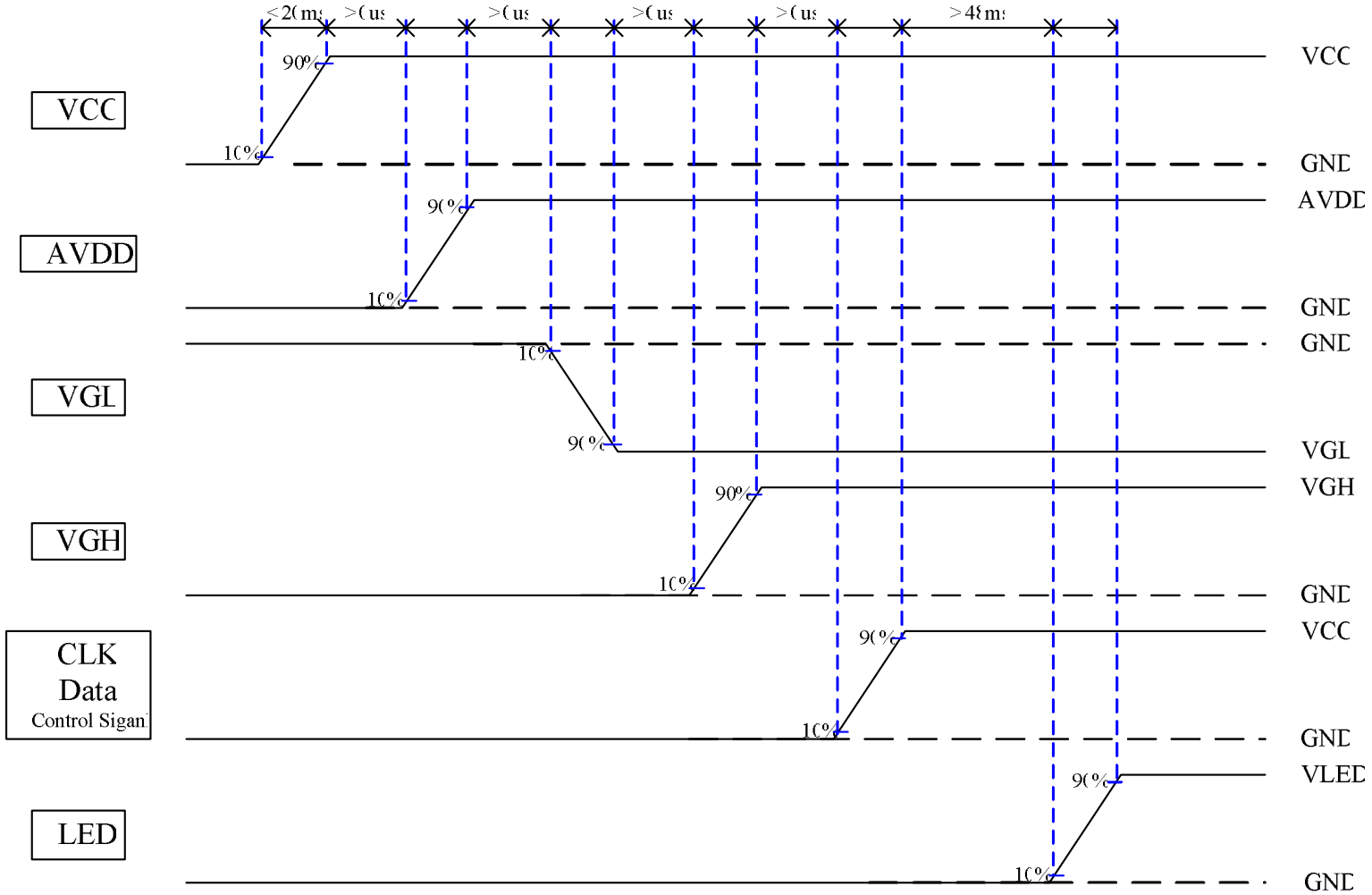




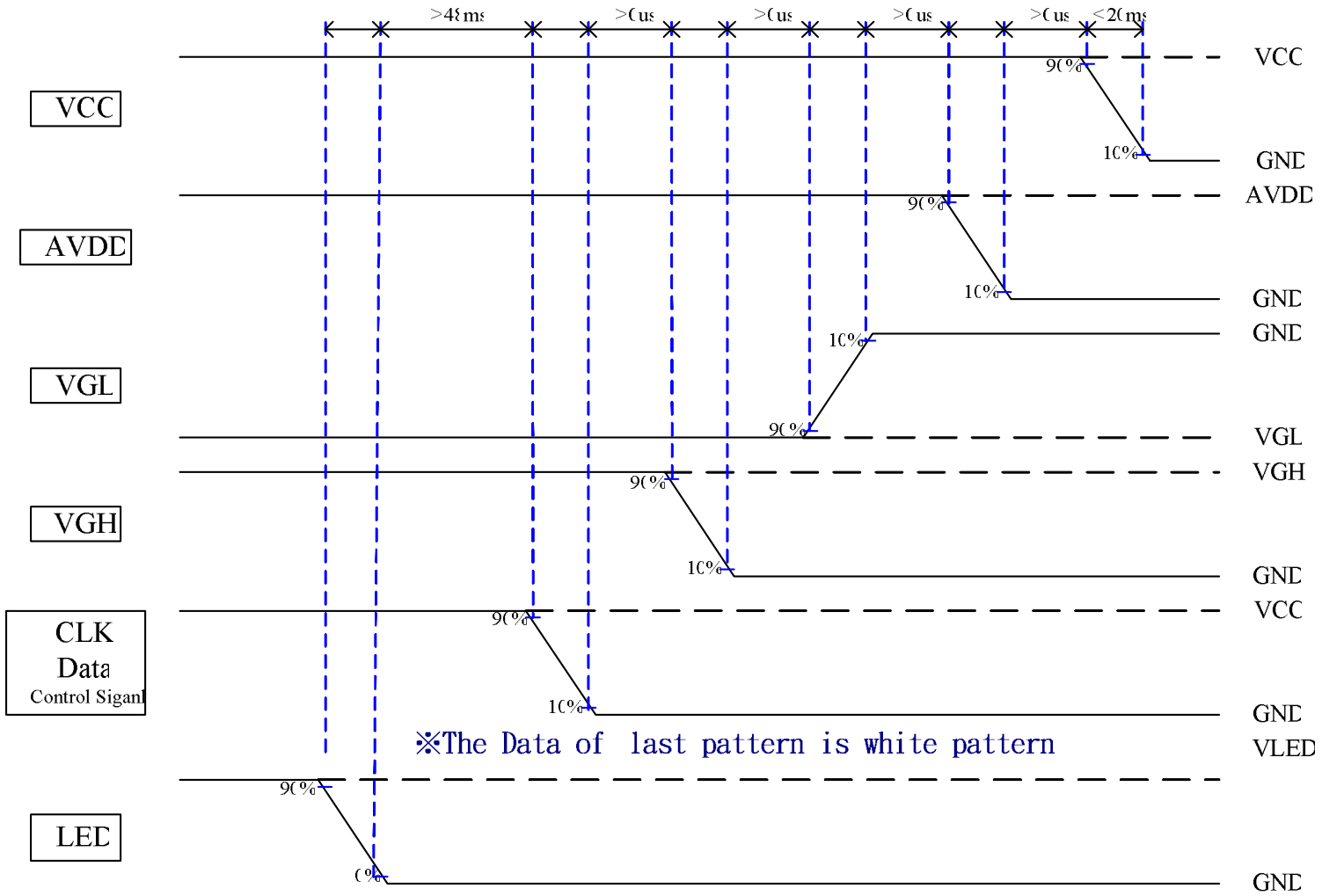




5. Recommended Power On Sequence

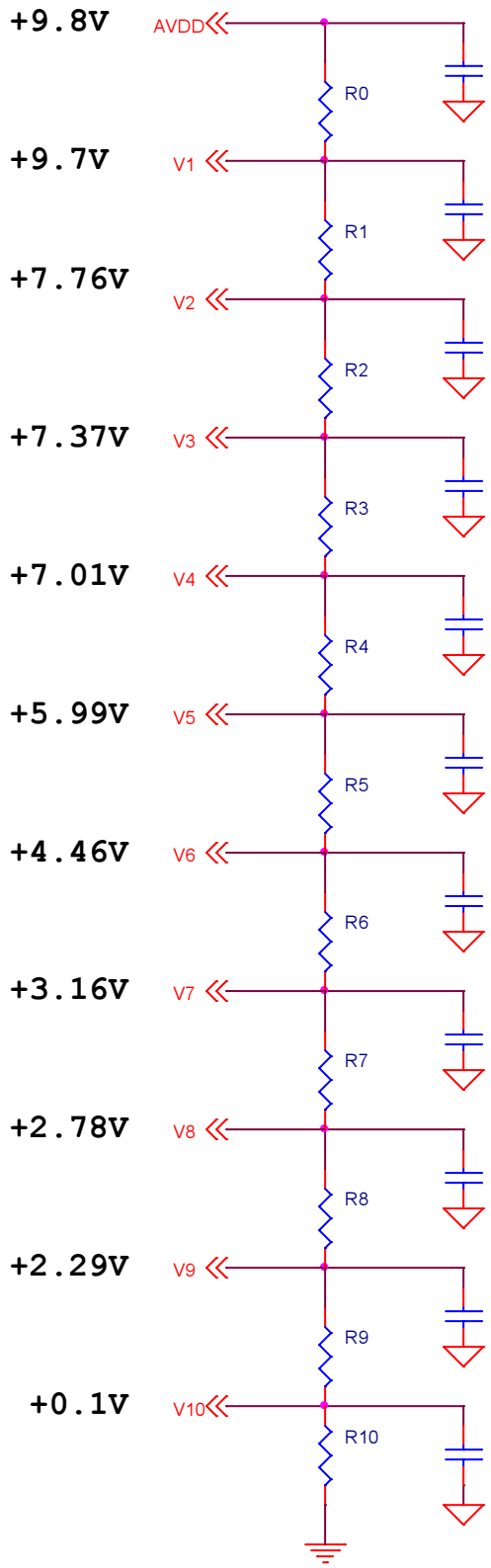


Power Off Sequence



6. Application Notes – (For Reference only, could be modified after the product come out.)

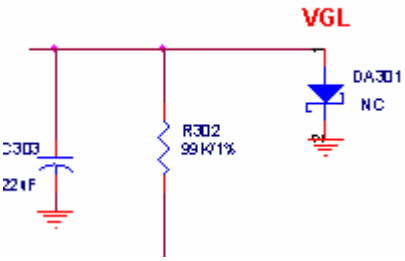
Typical application circuit – Gamma Circuit



Gamma	Voltage(V)
AVDD	**9.8**
V1	9.7
V2	7.76
V3	7.37
V4	7.01
V5	5.99
V6	4.46
V7	3.16
V8	2.78
V9	2.29
V10	0.1

R	ohm
R1	2.94K
R2	402
R3	510
R4	2.05K
R5	1.1K
R6	5.1K
R7	562
R8	576
R9	3.83K
R10	71.5

Typical application circuit – Circuit for VGL



Note. A Schottky diode is required to keep VGL not higher than 0.3V at all times, especially when VGL/VGH do not follow the sequence

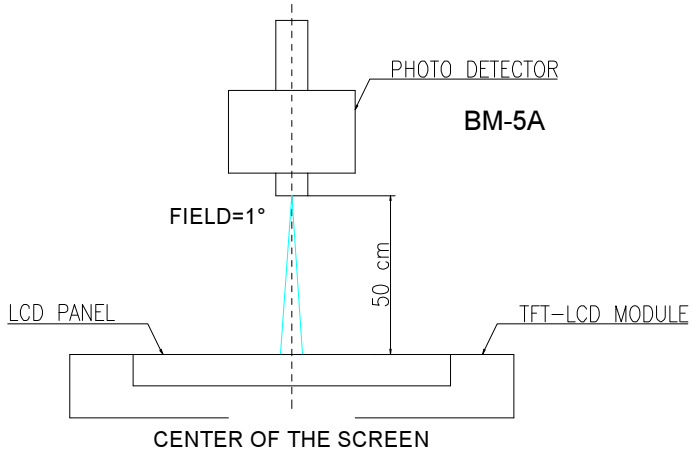
D. Optical Specification

All optical specification is measured under typical condition (Note 1, 2)

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time Rise Fall		 Tr Tf	 θ=0°	 -- --	 15 20		 ms ms	Note 3
Contrast ratio		CR	At optimized viewing angle	200	300	--		Note 4
Viewing Angle	Top Bottom Left Right		CR□10	50 35 50 50	65 50 65 65	-- -- -- --	deg.	Note 5
Brightness		Y_L	θ=0°	400	500	--	cd/m^2	Note 6
Chromaticity	White	X	θ=0°	0.26	0.31	0.36		
		Y	θ=0°	0.28	0.33	0.38		
	Red	X	θ=0°		0.588			
		Y	θ=0°		0.355			
	Green	X	θ=0°		0.333			
		Y	θ=0°		0.556			
	Blue	X	θ=0°		0.148			
		Y	θ=0°		0.093			
Uniformity		ΔY_L	%	70	75	--	%	Note 7

Note 1: Ambient temperature =25℃, To be measured in the dark room.

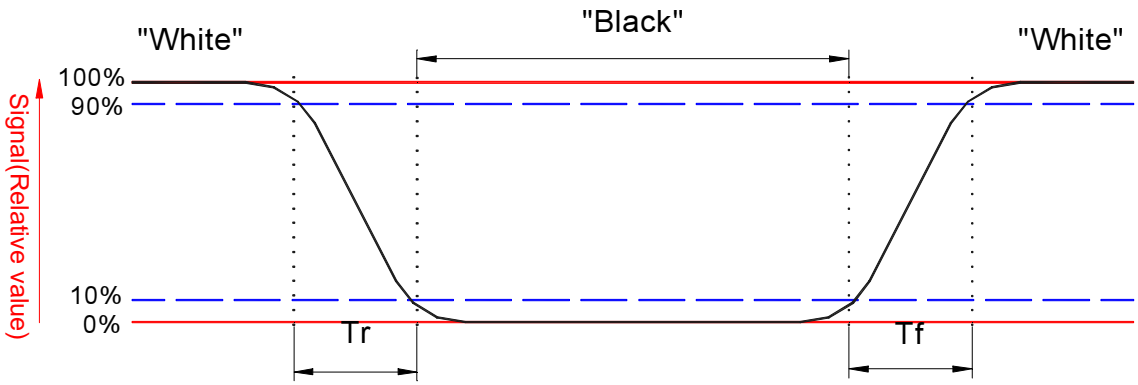
Note 2: To be measured on the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-5A, after 15 minutes operation.



Note 3: Definition of response time:

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

The response time is defined as the time interval between the 10% and 90% of amplitudes. Refer to figure as below.

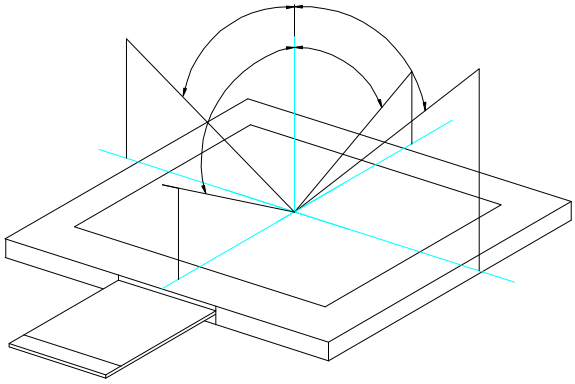


Note 4.Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

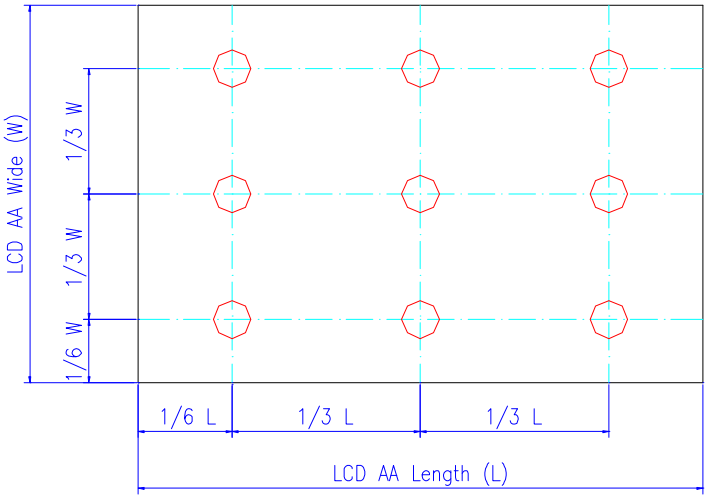
$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" status}}{\text{Photo detector output when LCD is at "Black" status}}$$

Note 5. Definition of viewing angle, θ, Refer to figure as below.



Note 6. Measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 7: Luminance Uniformity of these 9 points is defined as below:



$$\text{Uniformity} = \frac{\text{minimum luminance in 9 points (1-9)}}{\text{maximum luminance in 9 points (1-9)}}$$

Reliability Test Items

No.	Test items	Conditions		Remark
1	High temperature storage	Ta= 95□	240Hrs	Note 3
2	Low temperature storage	Ta= -40□	240Hrs	Note 3
3	High temperature operation	Tp= 85□	240Hrs	Note 3
4	Low temperature operation	Ta= -30□	240Hrs	Note 3
5	High temperature and high humidity	Tp= 60□, 90% RH	240Hrs	Operation Note 3
6	Heat shock	-30□~85□/100 cycles 1Hrs/cycle		Non-operation Note 3
7	Electrostatic discharge	330Ω, 150pF, 1sec, 8 point 25times/point	Contact: +/- 8KV Air: +/- 15KV	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		

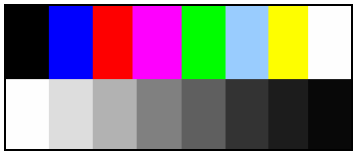
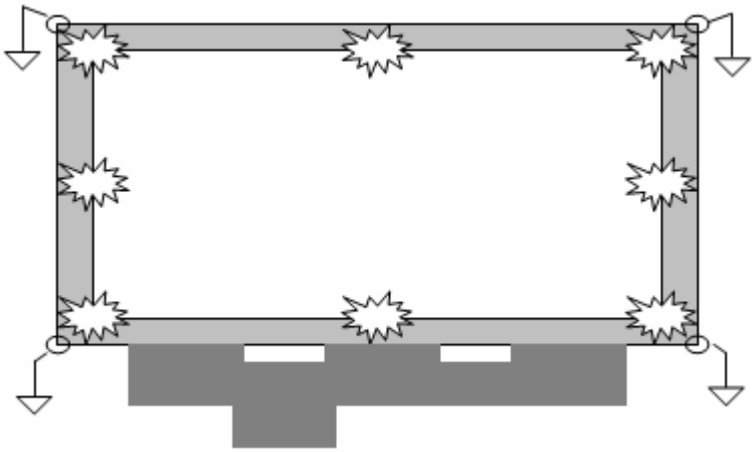
Note 1: Ta: Ambient Temperature. Tp: Panel Surface Temperature

Note 2: In the standard conditions, there is not display function failure issue occurred. All the cosmetic specification is judged before the reliability stress. All of test results are judged after sample surface temperature back to 25℃.

Note 3: Optical characteristics judgment criteria after 240H: (1) Brightness should be kept >70% of 0H brightness; (2) Compare to 0H, △Wx & △Wy should be less than 0.035.

Note 4: All test techniques follow IEC6100-4-2 standard

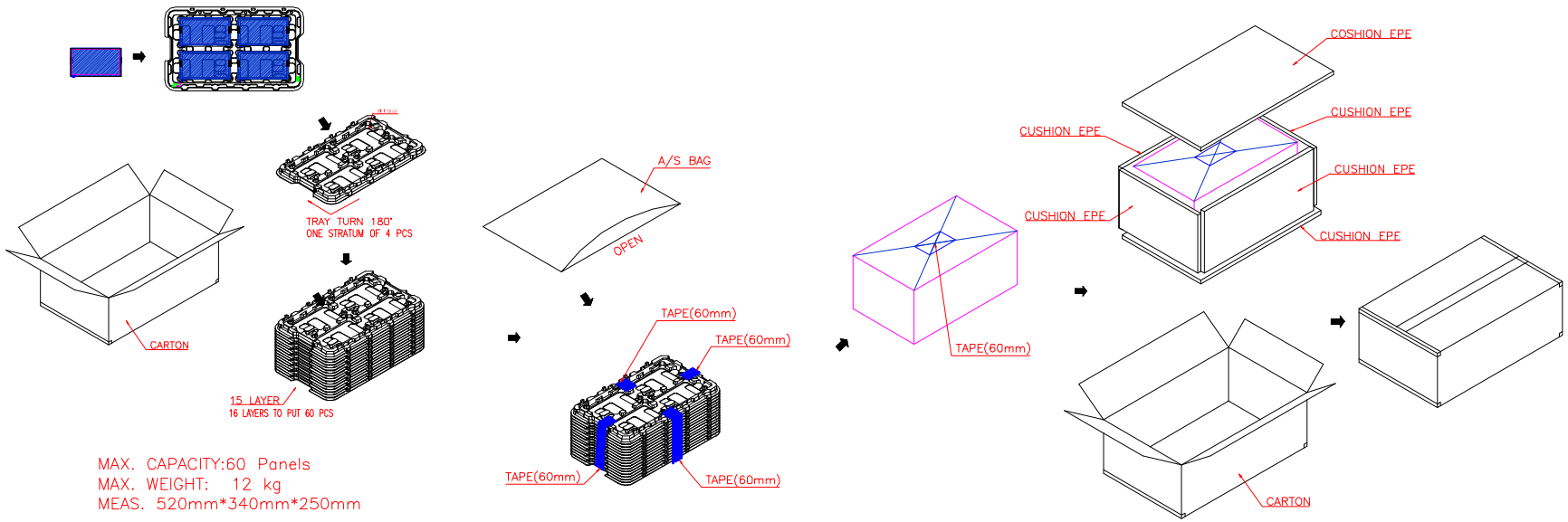
ESD Test Information

Test Condition		Note
Date	2009/12/17	
Model	C070VW05 V1	
Samples	6 pcs (contact 3pcs, air 3pcs)	
System	AUO Pattern Generator	
Instrument	Noiseken ESS-2000	
Ambient Temperature	22.5℃	
Relative Humidity	40%	
Pattern		
Procedure And Set-up	Contact Discharge：330Ω, 150pF, 1sec, 8 point, 25times/point Air Discharge：330Ω, 150pF, 1sec, 8 point, 25times/point 	
Criteria	A – Normal operation. No degradation. No failures B – Some performance degradation allowed. No data lost. Self-recoverable hardware failure. C – Temporary performance degradation. Recovery by operator is acceptable. No hardware failures. D – Hardware failures.	
Others		

※All test techniques follow IEC61000-4-2 standard.

E. Packing and Marking

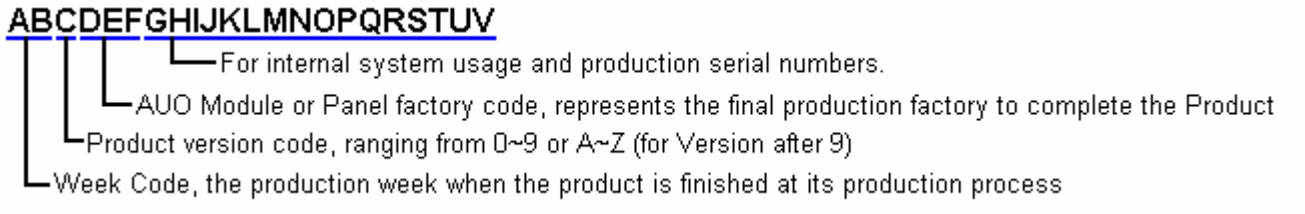
1. Packing Form



MAX. CAPACITY:60 Panels
MAX. WEIGHT: 12 kg
MEAS. 520mm*340mm*250mm

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:



Example:

501M06ZL06123456781Z05:

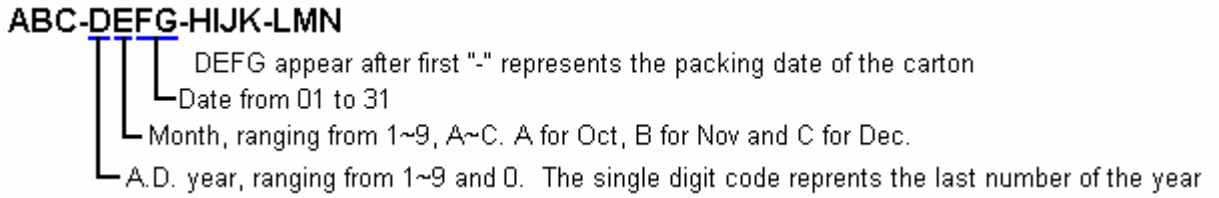
Product Manufacturing Week Code: WK50

Product Version: Version 1

Product Manufactuing Factory: M06

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 apparing in the following format:



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

F. 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.