



CUSTOMER APPROVAL SHEET

Company Name	
MODEL	C050VVN01.3
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)
- CUSTOMER REMARK :

AUO PM :

P/N : 97.05C13.300

Comment :

1 Li-Hsin Rd. 2. Science-Based Industrial Park
Hsinchu 300, Taiwan, R.O.C.
Tel: +886-3-500-8899
Fas: +886-3-577-2730

Doc. Version	0.3
Total Page	23
Date	2014/11/25

Product Specification

5" COLOR TFT-LCD MODULE

MODEL NAME: C050VVN01.3

< ◆ > Preliminary Specification

< > Final Specification

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

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Record of Revision

Version	Revise Date	Page	Content
0.0	20/ Aug/ 2014	All	<p>First draft. (Change C050VVN01.0 Polarizer from AGS1 to AG150. C050VVN01.3 product SPEC is revised from C050VVN01.0 product SPEC v0.6)</p> <ol style="list-style-type: none"> 1. update model name to C050VVN01.3 2. update drawing in page #7
0.1	26/ Aug/ 2014	12	Add Light Bar information
0.2	26/Sep/2014	7	Add the numbers of measurement in the drawing
0.3	25/Nov/2014	17	Update NTSC and Brightness data

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A. General Description

C050VFN01 is an a-Si & Transmissive type Thin Film Transistor Liquid crystal Display (TFT-LCD) with AMVA (Advanced MVA) technology. This model is composed of a TFT-LCD, a driver, a FPC (flexible printed circuit) · PCBA (printed circuit board assembly), and a backlight unit. TCON (timing controller) is also embedded in source driver.

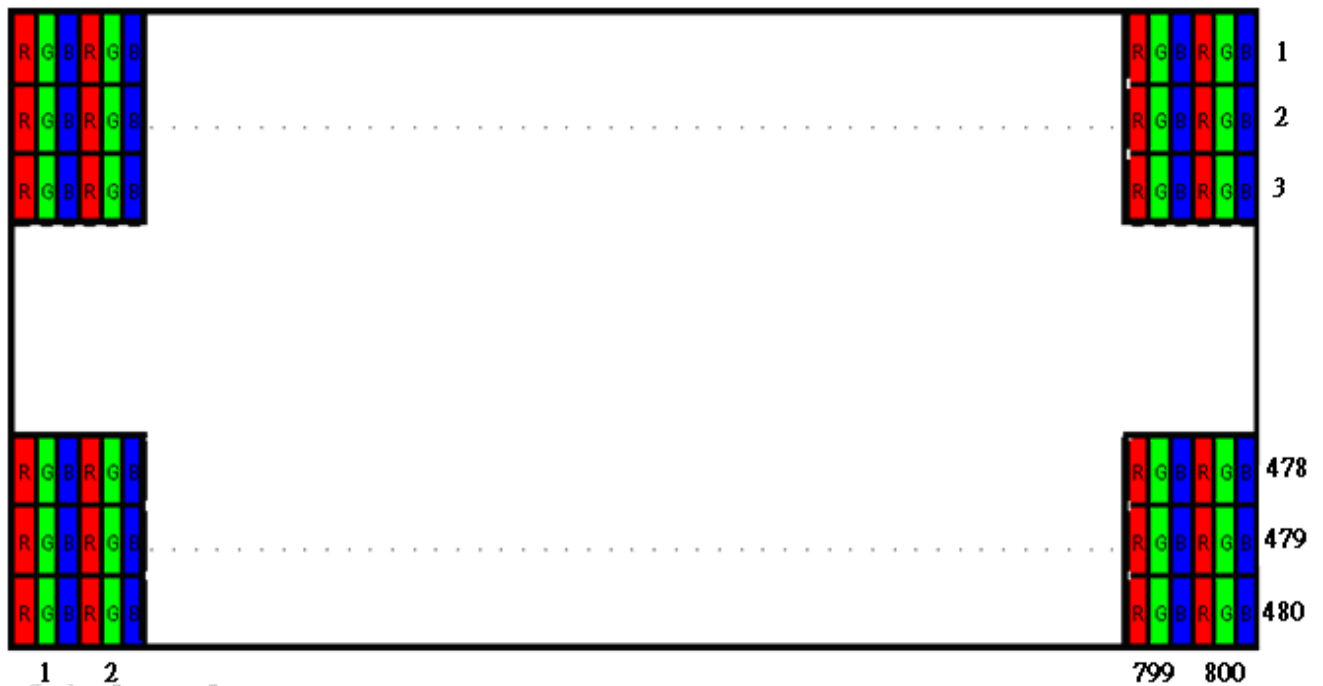
B. Features

- 5-inch (15:9) display
- 800RGB x 480 resolution in RGB stripe dot arrangement
- High brightness
- Interfaces: parallel RGB 24-bit (6bit+2bit FRC)
- Advanced MVA – wide view technology
- RoHS compliance

C. Physical Specifications

NO.	Item	Unit	Specification	Remark
1	Display Resolution	dot	800 RGB (H)×480(V)	
2	Active Area	mm	108.6(H)×65.16(V)	
3	Screen Size	inch	5(Diagonal)	
4	Dot Pitch	mm	0.04525(H)×RGBx0.13575(V)	
5	Color Configuration	--	R. G. B. Stripe	Note 1
6	Color Depth	--	16.2M Colors (6+2Bit RGB)	Note 2
7	Overall Dimension	mm	121.4(H) × 80.3(V) × 5.7(T)	Note 3
8	Weight	g	85	+/- 10%
9	Display Mode	--	Normally Black	
10	Surface Treatment		AG	

Note 1: Below figure shows dot stripe arrangement.

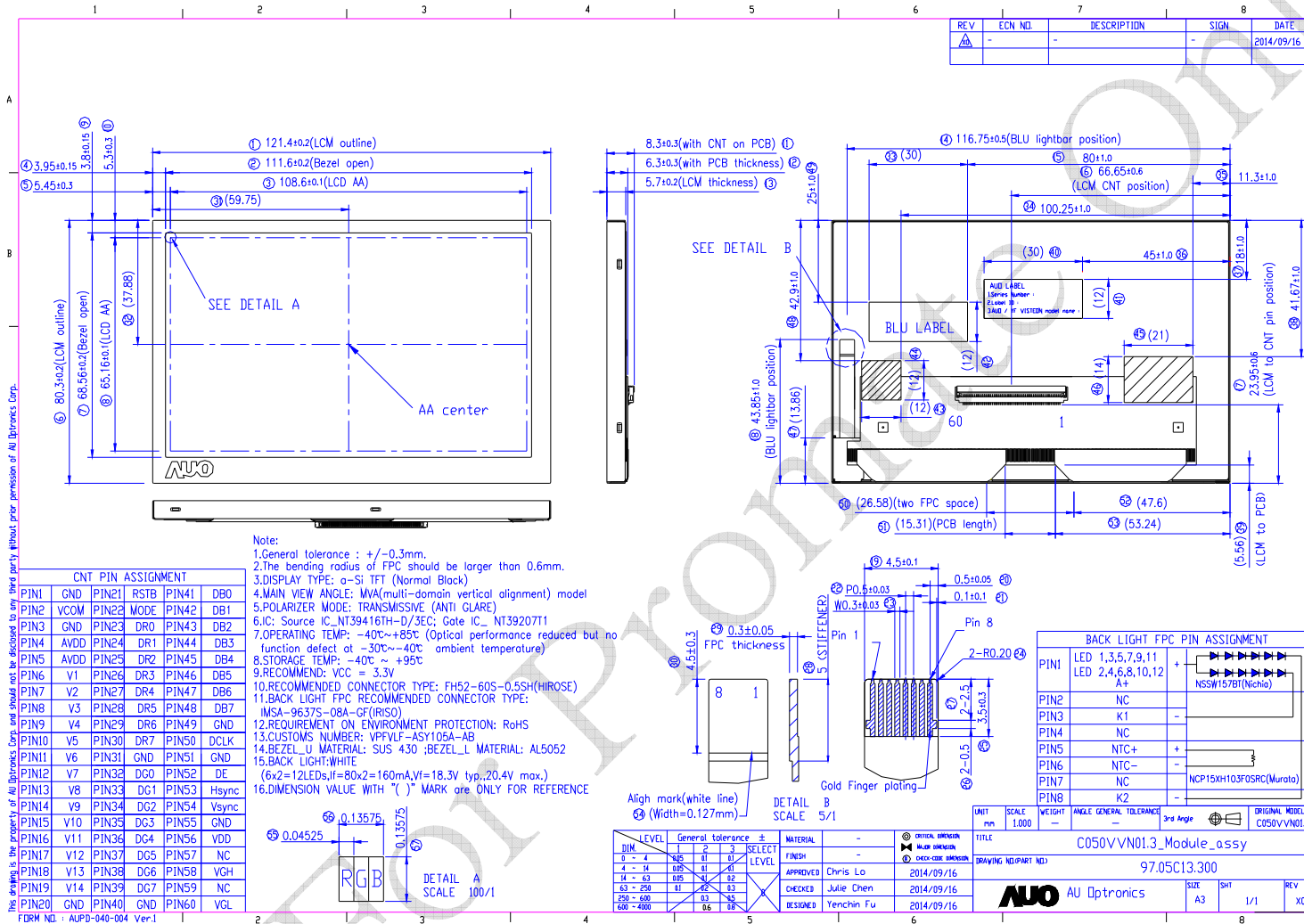


Note 2: Color Depth is 16.2M colors which is displayed by 6+2Bit RGB FRC.

Note 3: Not including FPC. Please refer to the drawing in page 6 for further information.



D. Outline Dimension



E. Electrical Specifications

1. Pin Assignment

Connector= Hirose FH52-60S-0.5SH

No.	Pin Name	I/O	Description	Remarks
1	GND	G	Ground	
2	VCOM	I	Common electrode driving voltage	
3	GND	G	Ground	
4	AVDD	P	Analog power supply voltage	
5	AVDD	P	Analog power supply voltage	
6	V1	I	Gamma correction voltage	
7	V2	I	Gamma correction voltage	
8	V3	I	Gamma correction voltage	
9	V4	I	Gamma correction voltage	
10	V5	I	Gamma correction voltage	
11	V6	I	Gamma correction voltage	
12	V7	I	Gamma correction voltage	
13	V8	I	Gamma correction voltage	
14	V9	I	Gamma correction voltage	
15	V10	I	Gamma correction voltage	
16	V11	I	Gamma correction voltage	
17	V12	I	Gamma correction voltage	
18	V13	I	Gamma correction voltage	
19	V14	I	Gamma correction voltage	
20	GND	G	Ground	
21	RSTB	I	Global reset pin. (low active)	
22	MODE	I	DE/SYNC mode selection. « H » for DE mode. "L" for HV mode.	
23	DR0	I	Red data input(LSB)	
24	DR1	I	Red data input	
25	DR2	I	Red data input	
26	DR3	I	Red data input	
27	DR4	I	Red data input	
28	DR5	I	Red data input	
29	DR6	I	Red data input	
30	DR7	I	Red data input(MSB)	
31	GND	G	Ground	
32	DG0	I	Green data input(LSB)	
33	DG1	I	Green data input	
34	DG2	I	Green data input	
35	DG3	I	Green data input	
36	DG4	I	Green data input	
37	DG5	I	Green data input	
38	DG6	I	Green data input	
39	DG7	I	Green data input(MSB)	
40	GND	G	Ground	
41	DB0	I	Blue data input(LSB)	
42	DB1	I	Blue data input	
43	DB2	I	Blue data input	
44	DB3	I	Blue data input	
45	DB4	I	Blue data input	
46	DB5	I	Blue data input	
47	DB6	I	Blue data input	
48	DB7	I	Blue data input(MSB)	
49	GND	G	Ground	
50	DCLK	I	Data clock Input	

51	GND	G	Ground	
52	DE	I	Data enable Input (High active)	
53	Hsync	I	Horizontal Sync input.	
54	Vsync	I	Vertical Sync input.	
55	GND	G	Ground	
56	VDD	PI	Digital power supply voltage.	
57	NC			
58	VGH	PI	Positive power supply voltage for TFT	
59	NC			
60	VGL	PI	Negative power supply voltage for TFT	

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

Backlight Pin Assignment Suggestion

(Suggestion Connector= IRISO 9637S-08A-GF)

No.	Pin Name	Description	Remarks
1	A+		
2	NC		
3	K1		
4	NC		
5	NTC+		
6	NTC-		
7	NC		
8	K2		

2. Absolute Maximum Ratings

Items	Symbol	Values		Unit	Condition
		Min.	Max.		
Power Voltage	VDD	-0.3	4.5	V	
	AVDD	-0.5	13.5	V	
	VGH	-0.3	20	V	
	VGL	-15	0.3	V	
	VGH-VGL	0	35	V	
Input Signal Voltage	Vi	-0.3	Vdd+ 0.3	V	
	Vref(V1~V7)	0.4AVDD	AVDD-0.3	V	
	Vref(V8~V14)	0.1	0.6AVDD	V	
	VCOM	-0.3	10	V	
Operation Temperature	Topa	-30	+85	°C	Ambient
Storage Temperature	Tstg	-40	+95	°C	Ambient
LED(each string)	Vf	-	20.4	V	
	If	0	150	mA	

Note 1: Functional operation should be restricted under normal ambient temperature.

3. Electrical Characteristics

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

a. TFT- LCD Panel

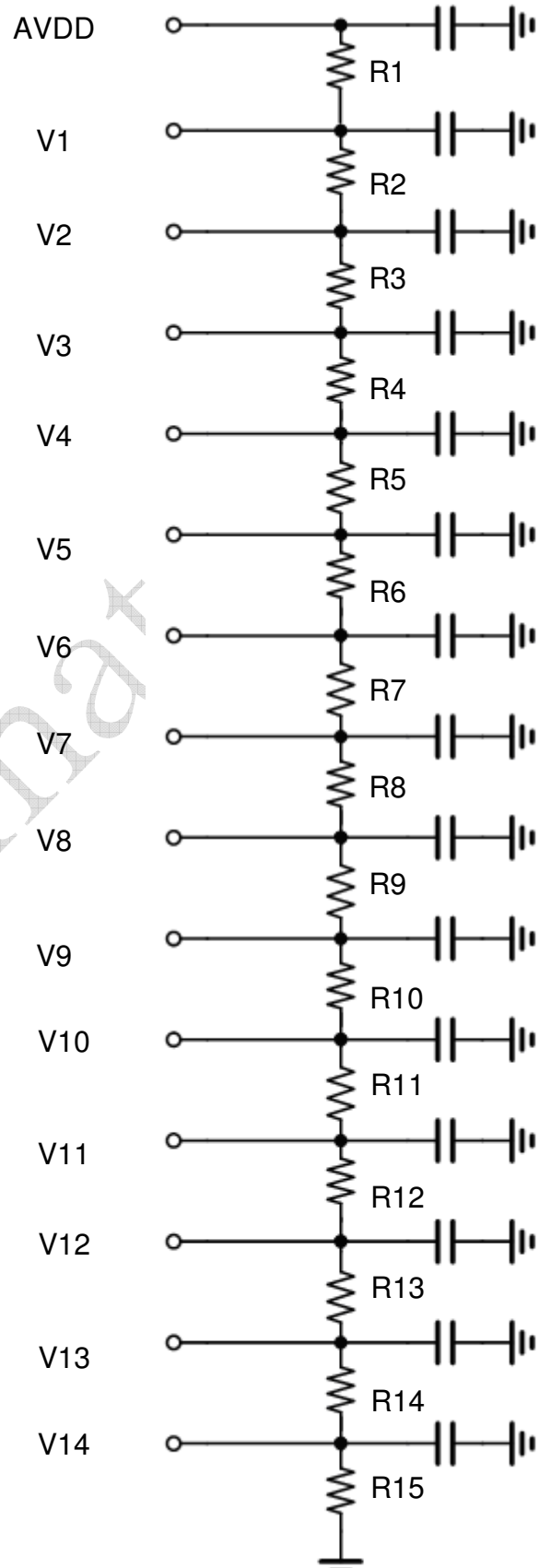
Parameter	Symbol	Min	Typ	Max	Unit	Notes
Power Supply	VDD	3.1	3.3	3.5	V	
	IVDD	--	6.7	13	mA	
	AVDD	V1+0.1	12.5	13.5	V	
	IAVDD	-	26	34	mA	
	VGH	14.5	15	15.5	V	
	IVGH	-	0.15	0.2	mA	
	VGL	-9.5	-9	-8.5	V	
	IVGL	-	0.2	0.3	mA	
	VCOM	4.9	5.0	5.1	V	TBD
Input Signal Voltage	IVCOM	-	0.3	0.65	uA	
	Vi	-0.3	-	Vdd+ 0.3	V	
	Vref(V1~V7)	0.4Avdd	-	Avdd-0.3	V	
	Vref(V8~V14)	0.1	-	0.6Avdd	V	
Input high voltage	Vh	0.7Vdd	-	Vdd	V	
Input low voltage	Vi	0	-	0.3Vdd		
Vertical cycle	f _v	50	60	80	Hz	
Horizontal cycle	f _H	28.9	31.5	42	kHz	
Dot Frequency	f _{DCLK}		33.3	45	MHz	

b. Recommend Gamma Voltage

Parameter	Symbol	Min	Typ	Max	Unit	Notes
Gamma Voltage	V1	-	12.24	-	V	
	V2	-	11.9	-	V	
	V3	-	10.51	-	V	
	V4	-	9.78	-	V	
	V5	-	9.47	-	V	
	V6	-	8.00	-	V	
	V7	-	7.80	-	V	
	V8	-	6.00	-	V	
	V9	-	5.20	-	V	
	V10	-	3.78	-	V	
	V11	-	3.24	-	V	
	V12	-	2.45	-	V	
	V13	-	0.98	-	V	
	V14	-	0.265	-	V	

Note1. Gamma voltage tolerance $\pm 1\%$.

Symbol	Resistor	Unit
R1	619	Ω
R2	887	Ω
R3	3480	Ω
R4	1870	Ω
R5	825	Ω
R6	3570	Ω
R7	665	Ω
R8	4320	Ω
R9	1960	Ω
R10	3650	Ω
R11	1270	Ω
R12	2000	Ω
R13	3650	Ω
R14	1820	Ω
R15	665	Ω



c. Backlight Driving Conditions (Note 1)

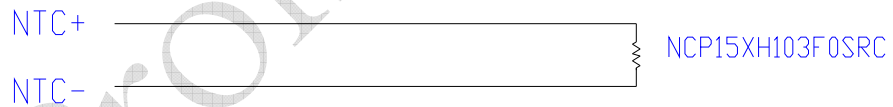
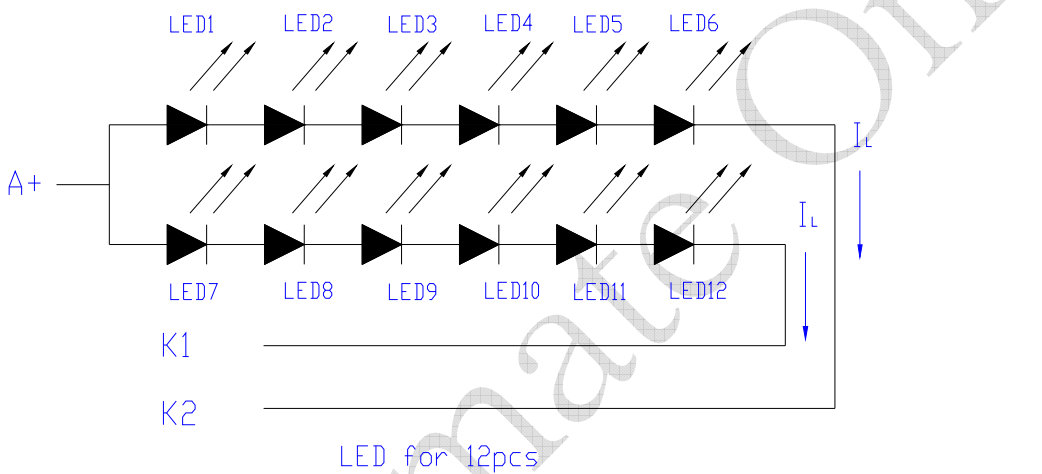
Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED Supply Current	I_L	-	80	-	mA	For single serial (Note 3)
LED Supply Voltage	V_L	16.2	18.3	20.4	V	Note 3, 4
LED Life Time	L_L	10000	---	---	Hr	Note 2

Note 1: LED backlight is 12 LEDs (2 strings, 6pcs for each string).

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

Note 3: The LED Voltage is under driving current=80mA./string

Note 4: The voltage capacity of LED driver IC must be over max. of LED Voltage.



LED Ink Area
 X: mark $I_v(1,2,3)$
 Y: color rank(4~6)
 Z: mark $V_f(a-c,n)$

Vf		Color		Iv	
Mark	Rank	Mark	Rank	Mark	Rank
n	2.7V-2.8V	4	t01	1	25.5~27.8lm
a	2.8V-3.0V	5	t02	2	27.8~30.3lm
b	3.0V-3.2V	6	t03	3	30.3~33lm
c	3.2V-3.4V				

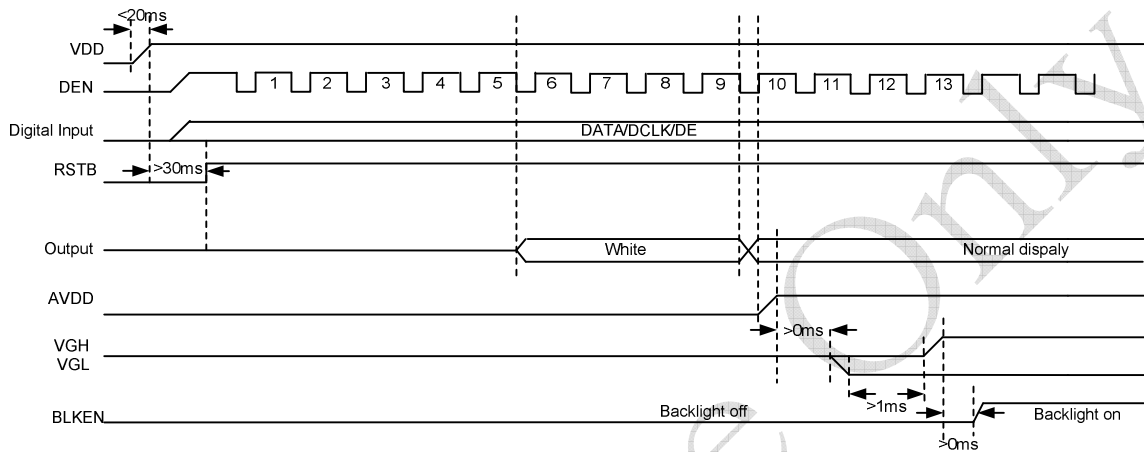
4. AC Timing

a. Power on/off sequence

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

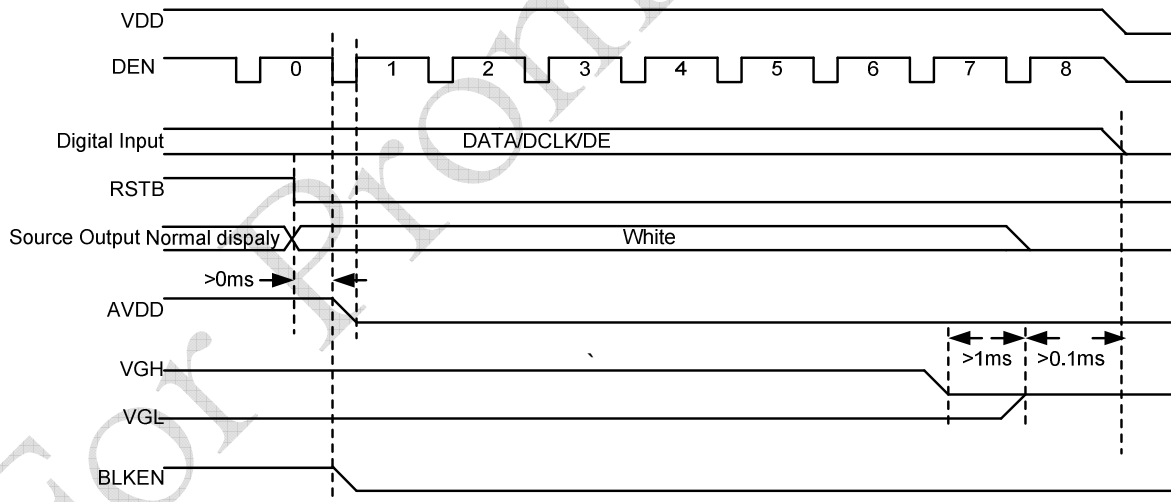
Power on sequence:

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



Power-Off

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



DEN : Defined a frame period and created internally by DE. It is similar vertical sync.

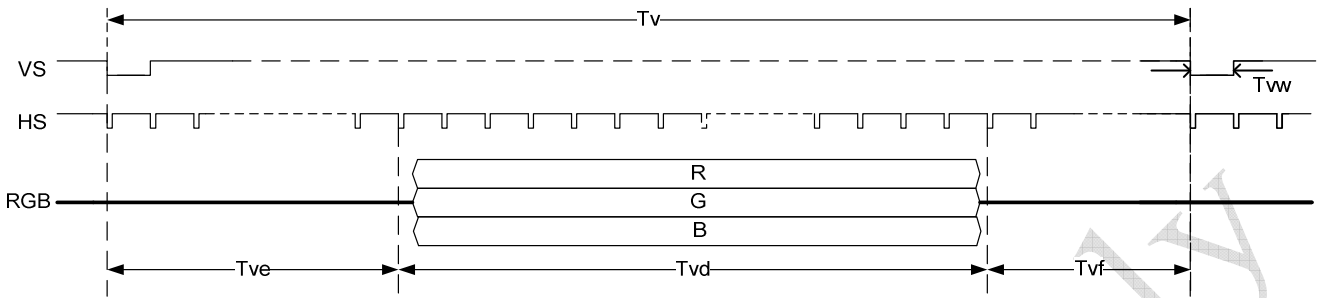
RSTB : Global reset ,normally pulled high.

Suggest to connecting with an RC reset circuit for stability .Normally pull high.

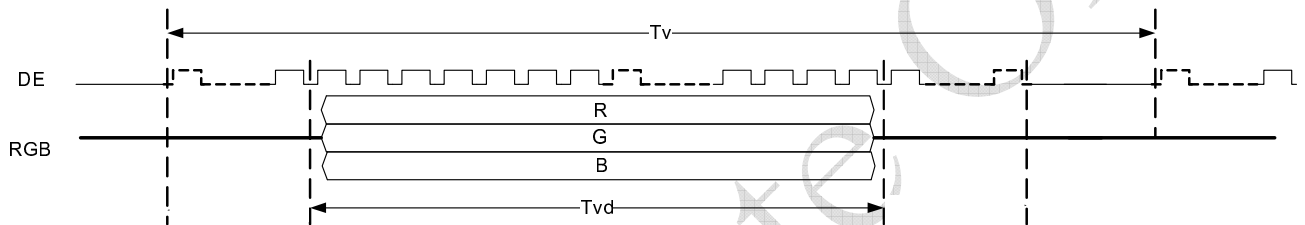
b. Timing Condition

Item	Symbol	Min	Typ	Max	Unit	Remark
DCLK frequency	dclk	30.5	33.3	45	MHZ	
DCLK cycle time	Tdclk	22	30	-	ns	=1/Fdclk
DCLK pulse duty	Tcwh	40	50	60	%	
Vertical display area	Tvd	480	480	480	H	
Vertical period area	Tv	522	525	762	H	
Vertical blanking area	Tvb	42	45	282	H	=Tv-Tvd
Vertical pulse width	Tvw		1			
Vertical back porch	Tve		31			
Vertical front porch	Tvf		13			
Horizontal display area	Thd	800	800	800	dclk	
Horizontal period area	Th	910	1056	1138	dclk	
Horizontal blanking area	Thb	110	256	338	dclk	=Th-Thd
Horizontal pulse width	Thw		48			
Horizontal back porch	The		40			
Horizontal front porch	Thf		168			
Data setup time	Tds	8	-	-	ns	DCLK Rising Latch
Data hold time	Tdh	8	-	-	ns	

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

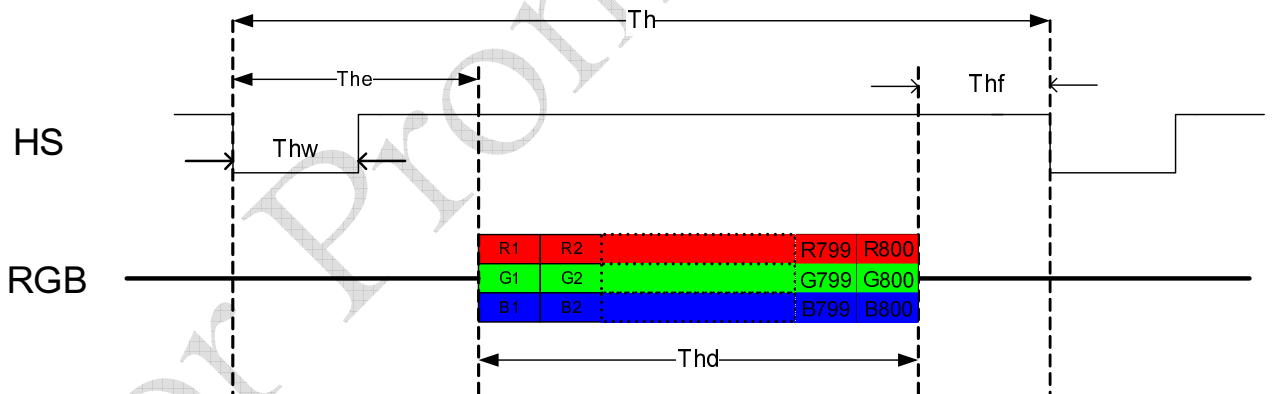


DE Mode :

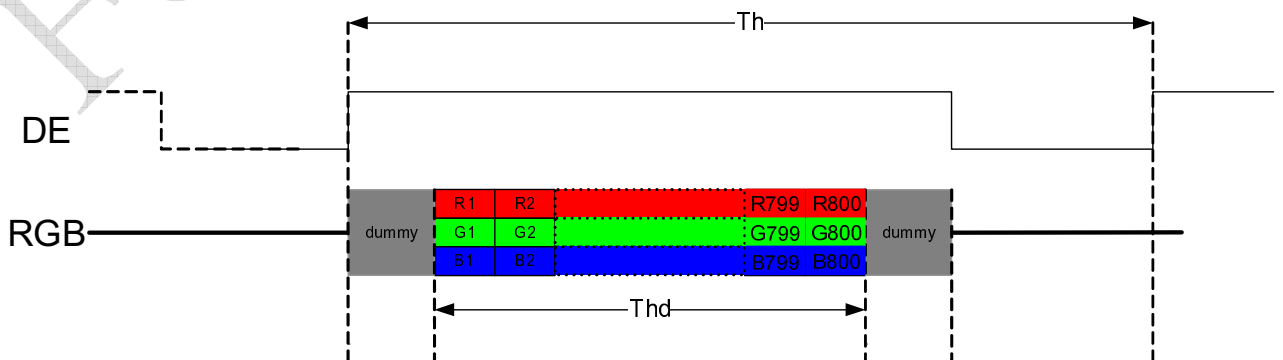


Horizontal Timing of Input

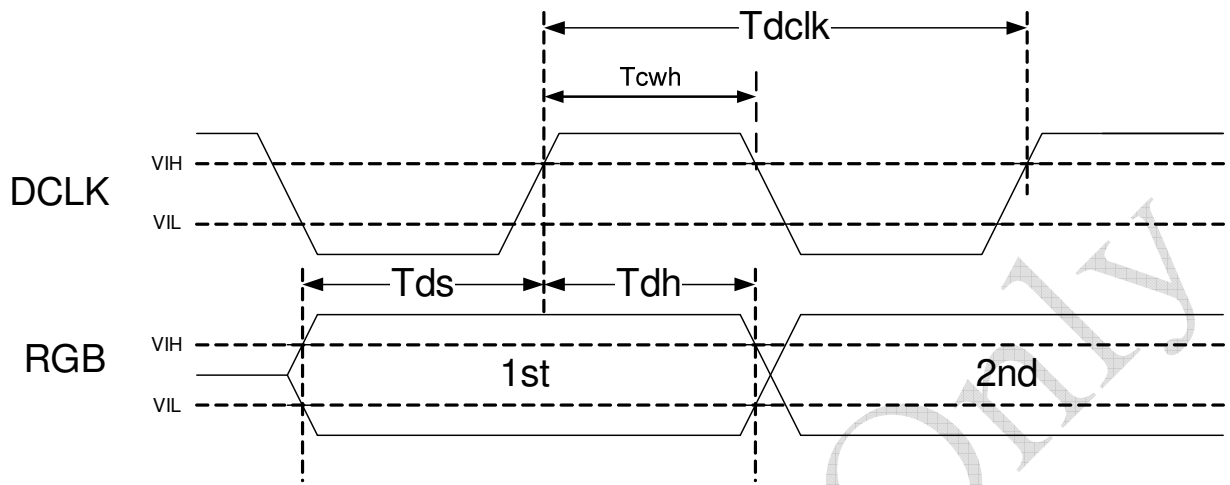
HV Mode :



DE Mode :



Clock and Data Timing of Input



F. Optical specifications (Note 1, 2)

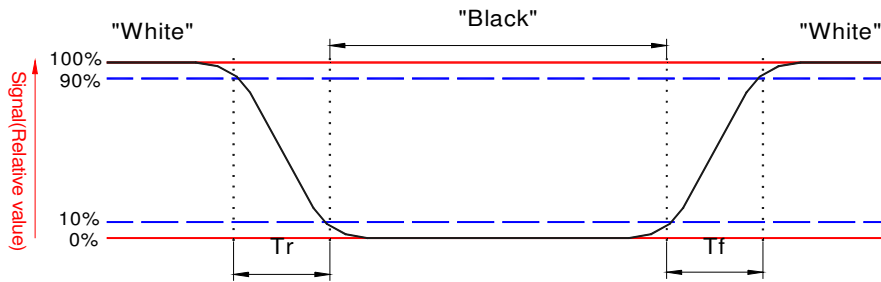
Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Response Time Rise Fall	T_r T_f	$\theta = 0^\circ$	- -		15 30	ms ms	Note 3
Contrast ratio		$\theta = 0^\circ$	1000				Note 4, 5
Viewing Angle Top Bottom Left Right		$CR \geq 10$	70 70 70 70	80 80 80 80	- - - -	deg.	Note. 7
Brightness	Y_L	$\theta = 0^\circ$	725	875	1160	nits	Note 1,2,9
		ID18	540	-	-	nits	Note 6
		ID19	384	-	-	nits	Note 6
		ID20	264	-	-	nits	Note 6
White Chromaticity	X	$\theta = 0^\circ$	0.288	0.318	0.348		Note 2
	Y	$\theta = 0^\circ$	0.300	0.330	0.360		
Red Chromaticity	X	$\theta = 0^\circ$	0.577	0.617	0.657		
	Y	$\theta = 0^\circ$	0.321	0.361	0.401		
Green Chromaticity	X	$\theta = 0^\circ$	0.271	0.311	0.351		
	Y	$\theta = 0^\circ$	0.534	0.574	0.614		
Blue Chromaticity	X	$\theta = 0^\circ$	0.111	0.151	0.191		
	Y	$\theta = 0^\circ$	0.026	0.066	0.106		
Uniformity		$\theta = 0^\circ$	80	-	-	%	Note 9
NTSC			37	60	87	%	Note 10

Note 1: Measurement should be performed in the dark room, optical ambient temperature $\approx 25^\circ\text{C}$, and each LED current $I_L = 80\text{ mA}$

Note 2: To be measured on the center area of panel with a field angle 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.

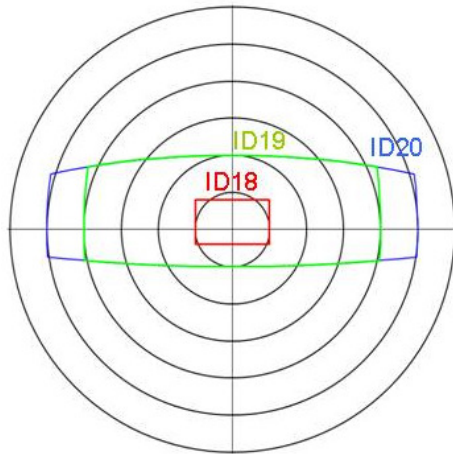


Note 4. From liquid crystal characteristics, response time will become slower and the color of panel will become darker when ambient temperature is below 25°C.

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

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

Note 6. Definition points in ID18~ID20, see below.



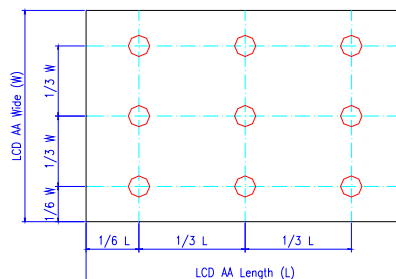
Viewing areas	Cartesian coordinates		Polar coordinates	
	horiz.	vert.	theta	phi
A: +/-10°, +8°/-4° ID18	10	8	12,7	38,6
	-10	8	12,7	141,4
	-10	-4	10,7	201,6
	10	-4	10,7	338,4
A: +/-40°, +20°/-10° ID19	40	20	42,4	23,4
	-40	20	42,4	156,6
	-40	-10	40,6	191,9
	40	-10	40,6	348,1
B: +/-50°, +20°/-10° ID20	50	20	51,3	17,0
	-50	20	51,3	163,0
	-50	-10	50,3	188,4
	50	-10	50,3	351,6

Note 7. The viewing angles are measured at the center area of the panel when all the input terminals of LCD panel are electrically opened.

Note 8. Brightness is measured at the center of the display with white pattern in 80mA

Note 9. Luminance Uniformity is defined as following within the 9 measurements ,

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



Note 10. NTSC Data: $0.5 * ((\text{Red}_x - \text{Blue}_x) * (\text{Green}_y - \text{Blue}_y) - (\text{Red}_y - \text{Blue}_y) * (\text{Green}_x - \text{Blue}_x)) / 0.1582$

(Value 0.1582 is NTSC 100% triangle area from Red(x,y)=(0.67,0.33); Green(x,y)=(0.21,0.71); Blue(x,y)=(0.14,0.08))

G. Reliability Test Items (Note 2, 3)

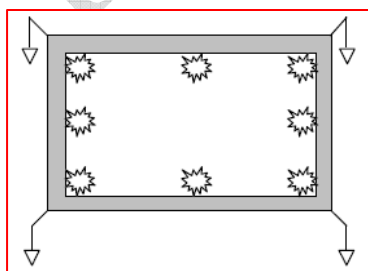
No.	Test items	Conditions		Remark
1	High temperature storage	Ta= 95°C	240Hrs	Note1
2	Low temperature storage	Ta= -40°C	240Hrs	
3	High temperature operation	Ta= 85°C	240Hrs	
4	Low temperature operation	Ta= -30°C	240Hrs	Note1
5	High temperature and high humidity	Ta= 60°C, 90% RH	240Hrs	Operation
6	Heat shock	-30°C ~85°C/100 cycles 1Hrs/cycle		Non-operation
7	Electrostatic discharge	Contact = ± 8 kV, 1sec, 8 point, 10 times/point class B (R=330Ω,C=150pF) Air = ± 15 kV, 1sec, 8 point, 10 times/point class B (R=330Ω,C=150pF)		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.

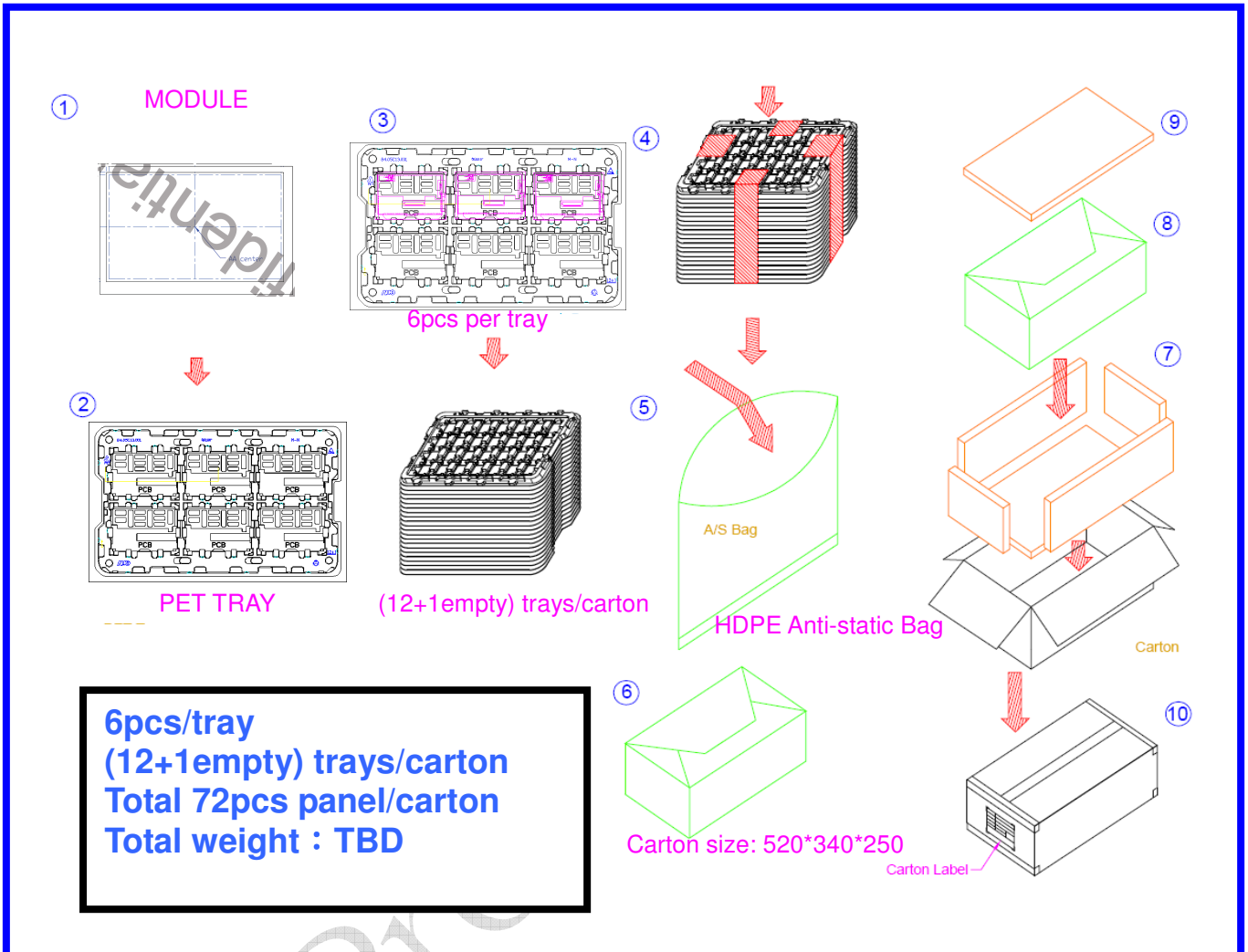
Note 2: In the standard condition, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.

Note 3: I_L=80mA ; In no.1~6, judge performance after back to room temperature for two hours.

Note 4: Test techniques follow IEC61000-4-2 standard.Class B – Some performance degradation allowed.
No data lost. Self-recoverable. No hardware failures.



H. Packing Form



2. Module/Panel Label Information

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

ABCDEFGHIJKLMNOPQRSTUV

- For internal system usage and production serial numbers.
- AUO Module or Panel factory code, represents the final production factory to complete the Product
- Product version code, ranging from 0~9 or A~Z (for Version after 9)
- Week Code, the production week when the product is finished at its production process

Example:

501S16ZL06123456781Z05:
Product Manufacturing Week Code: WK50
Product Version: Version 1
Product Manufacturing Factory: S16 (Xiamen, China)

3. Carton Label Information

The packing carton will be attached with a carton label where packing Q'ty, AUO Model Name, AUO Part Number, Customer Part Number (Optional) and a series of Carton Number in 13 or 14 digits are printed. The Carton Number is appearing in the following format:

ABC-DEFG-HIJK-LMN

- DEF appear after first "-" represents the packing date of the carton
 - Date from 01 to 31
 - Month, ranging from 1~9, A~C. A for Oct, B for Nov and C for Dec.
 - A.D. year, ranging from 1~9 and 0. The single digit code represents the last number of the year

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

I. Appendix

1. Reflection Data

model	Sample No.	Minolta
		SCI
C050VVN01	1	4.50%
	2	4.56%
	3	4.57%
	4	4.68%
	5	4.52%
	6	4.60%
	7	4.61%
	8	4.67%
	9	4.67%
	10	4.57%
	11	4.68%
	12	4.68%
	13	4.68%
	14	4.68%
	15	4.68%
	AVG	4.62%
	std	0.07%
	-4*std	4.36%
+4*std	4.89%	

2. LED color rank

Rank t01				
x	0.2945	0.2915	0.2955	0.2985
y	0.2760	0.2910	0.2980	0.2830

Rank t02				
x	0.2905	0.2875	0.2915	0.2945
y	0.2680	0.2830	0.2910	0.2760

Rank t03				
x	0.2865	0.2835	0.2875	0.2905
y	0.2610	0.2760	0.2830	0.2680