CUSTOMER APPROVAL SHEET

Company Name	
MODEL	**A104SN03 V1**
CUSTOMER APPROVED	Title : Name :

☐ **APPROVAL FOR SPECIFICATIONS ONLY (Spec. Ver. 0.4)**

☐ **APPROVAL FOR SPECIFICATIONS AND ES SAMPLE (Spec. Ver. 0.4)**

☐ **APPROVAL FOR SPECIFICATIONS AND CS SAMPLE (Spec. Ver. 0.4)**

☐ **CUSTOMER REMARK :**

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Product Specification

10.4" COLOR TFT-LCD MODULE

Model Name： **A104SN03 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	2022.04.08	All	First Draft	EC IC and change P/N to control (97D10A07.111)
0.2	2022.7.13	17		Update color Chromaticity
		3		Update backlight power consumption
0.3	2022.11.02	14		Update the drawing of DE mode setting (DE mode trigger with the falling edge of DCLK)
0.3.1	2022.11.28	14		Update the drawing of DE mode setting
0.4	2022.12.19	6		Update the pin30 ~ pin34 to NC
		13		Add signal AC characteristics
		15		Update the drawing of DE mode setting (DE mode trigger with the rising edge of DCLK)

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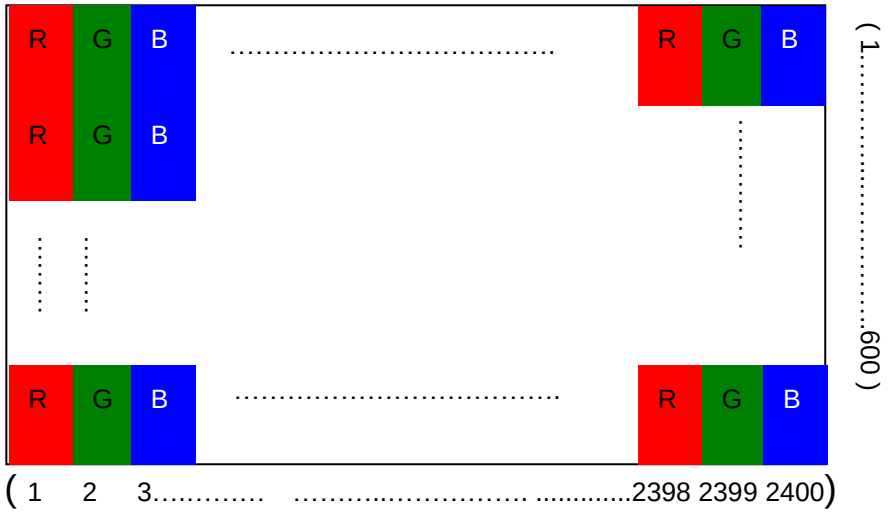
A. General Information

This product is a general display module which can be composed in various systems such as digital photo frame, mobile internet divices, portale navigation devices amd etc.

NO.	Item	Unit	Specification	Remark
1	Screen Size	inch	10.4(Diagonal)	
2	Display Resolution	dot	800RGB(W)x600(H)	
3	Overall Dimension	mm	228.4(W)x175.4(H)x6.2(D)	Note 1
4	Active Area	mm	211.2(W)x158.4(H)	
5	Pixel Pitch	mm	0.264(W)x0.264(H)	
6	Color Configuration	--	R. G. B. Stripe	Note 2
7	Color Depth	--	16.7M Colors	Note 3
8	NTSC Ratio	%	50	
9	Display Mode	--	Normally White	
10	Panel surface Treatment	--	Anti-Glare, 3H	
11	Weight	g	400±20	
12	Panel Power Consumption	W	192mW(Typ.)	Note 4
13	Backlight Power Consumption	W	3.164 (Typ)	
14	Viewing direction		6 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.

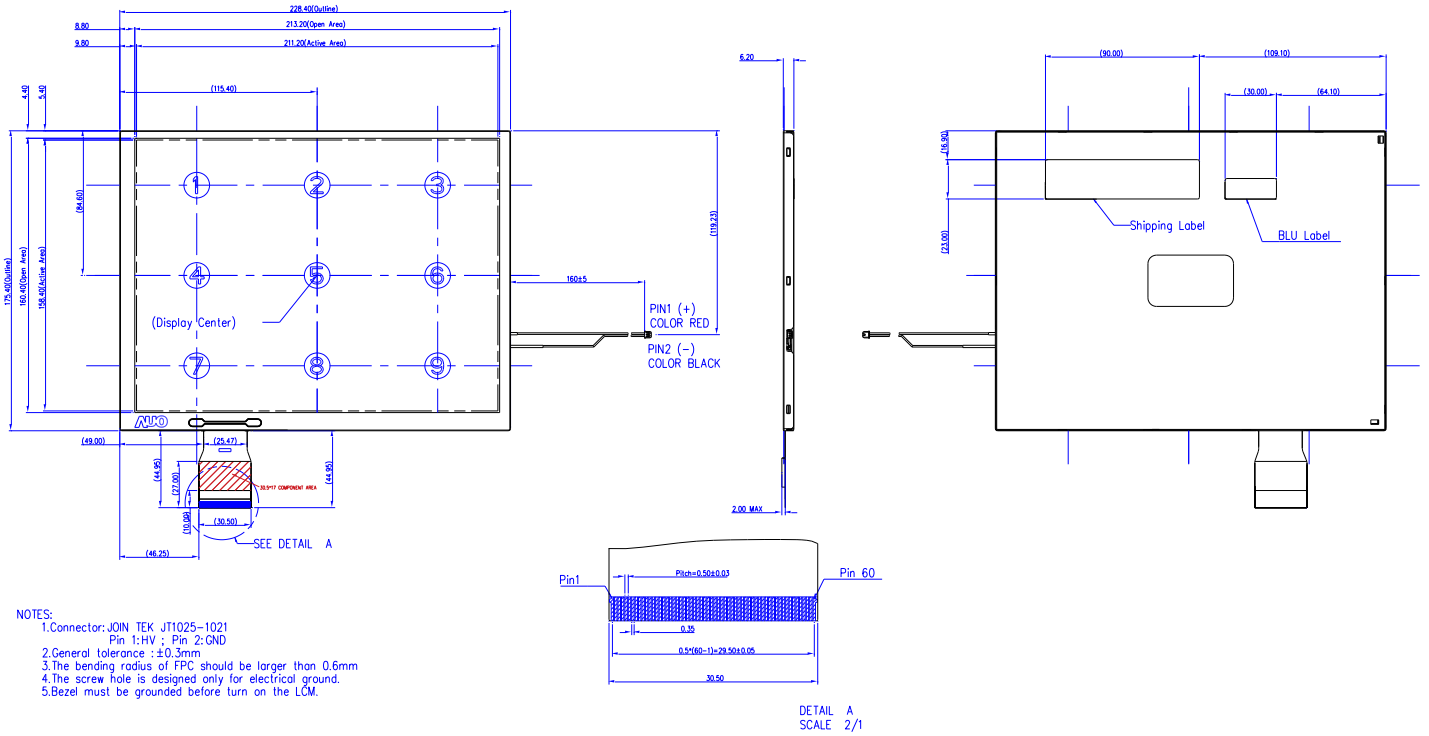


Note 3: The full color display depends on 24-bit data signal (pin 4~27).

Note 4: Please refer to Electrical Characteristics chapter.

B. Outline Dimension

1. TFT-LCD Module



C. Electrical Specifications

1. TFT LCD Panel Pin Assignment

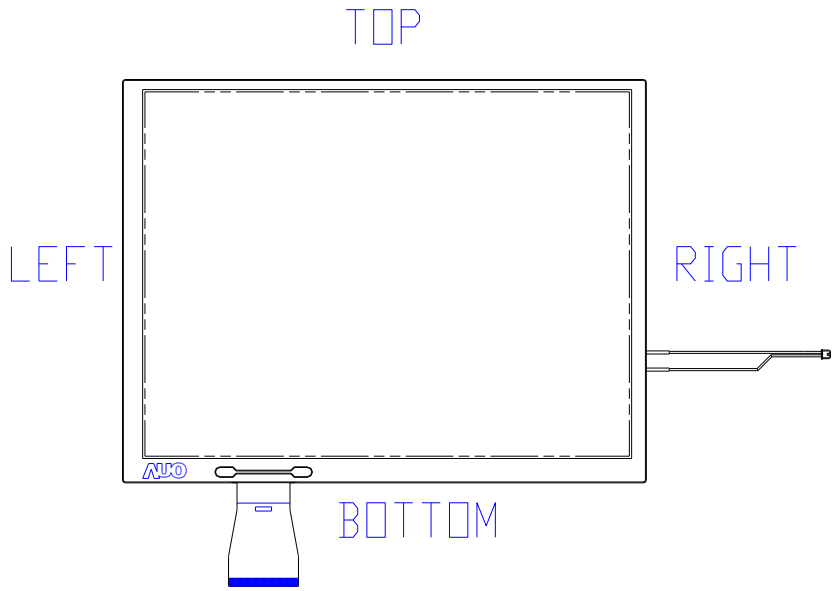
Recommended connector : HRS FH28-60S-0.5SH

Pin no	Symbol	I/O	Description	Remark
1	AGND	P	Ground for analog circuit	
2	AVDD	P	Analog power supply voltage	
3	VDDIO	P	Digital interface supply voltage	
4	R0	I	Red data input (LSB)	
5	R1	I	Red data input	
6	R2	I	Red data input	
7	R3	I	Red data input	
8	R4	I	Red data input	
9	R5	I	Red data input	
10	R6	I	Red data input	
11	R7	I	Red data input (MSB)	
12	G0	I	Green data input (LSB)	
13	G1	I	Green data input	
14	G2	I	Green data input	
15	G3	I	Green data input	
16	G4	I	Green data input	
17	G5	I	Green data input	
18	G6	I	Green data input	
19	G7	I	Green data input (MSB)	
20	B0	I	Blue data input (LSB)	

21	B1	I	Blue data input	
22	B2	I	Blue data input	
23	B3	I	Blue data input	
24	B4	I	Blue data input	
25	B5	I	Blue data input	
26	B6	I	Blue data input	
27	B7	I	Blue data input (MSB)	
28	DCLK	I	Data clock input	
29	DE	I	Data enable signal	
30	NC	-	For test, do not connect (Please leave it open)	
31	NC	-	For test, do not connect (Please leave it open)	
32	NC	-	For test, do not connect (Please leave it open)	
33	NC	-	For test, do not connect (Please leave it open)	
34	NC	-	For test, do not connect (Please leave it open)	
35	NC	-	For test, do not connect (Please leave it open)	
36	VDDIO	P	Digital interface supply voltage	
37	NC	-	For test, do not connect (Please leave it open)	
38	GND	P	Ground for digital circuit	
39	AGND	P	Ground for analog circuit	
40	AVDD	P	Analog power supply voltage	
41	VCOMin	I	For external VCOM DC input	
42	DITH	I	Dithering setting DITH = "L" 6bit resolution(LSB last 2 bits of input data turncated) (Default setting) DITH = "H" 8bit resolution	

43	NC	-	For test, do not connect (Please leave it open)	
44	VCOM	O	connect a capacitor	
45	NC	-	For test, do not connect (Please leave it open)	
46	NC	-	For test, do not connect (Please leave it open)	
47	NC	-	For test, do not connect (Please leave it open)	
48	NC	-	For test, do not connect (Please leave it open)	
49	NC	-	For test, do not connect (Please leave it open)	
50	NC	-	For test, do not connect (Please leave it open)	
51	NC	-	For test, do not connect (Please leave it open)	
52	NC	-	For test, do not connect (Please leave it open)	
53	NC	-	For test, do not connect (Please leave it open)	
54	NC	-	For test, do not connect (Please leave it open)	
55	NC	-	For test, do not connect (Please leave it open)	
56	VGH	P	Positive power for TFT	
57	VDDIO	P	Digital interface supply voltage	
58	VGL	P	Negative power supply for Gate driver.	
59	GND	P	Ground for digital circuit	
60	NC	-	For test, do not connect (Please leave it open)	

I: Input; P: Power



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2. Backlight Pin Assignment

Recommended connector : JOIN TEK JT1025-1021

Pin no	Symbol	I/O	Description	Remark
1	VLED+	P	Backlight LED anode	
2	VLED-	P	Backlight LED cathode	

3. Absolute Maximum Ratings

Item	Symbol	Conditio	Min.	Max.	Unit	Remark
Power voltage	VDDIO	GND=0	-0.5	5	V	Digital Power Supply
	AVDD	AGND=0	-0.5	15	V	Analog power supply
	VGH	GND=0	-0.3	42	V	Gate driver supply voltage
	VGL		-20	0.3	V	Gate driver supply voltage
	VGH－VGL		-	40	V	Gate driver supply voltage
Input signal voltage	V_I		-0.3	VDDIO+0.3	V	Note 1
	VCOMin		0	5	V	VCOM DC Voltage
Operating	Topa		-10	60	℃	
Storage	Tstg		-20	70	℃	

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

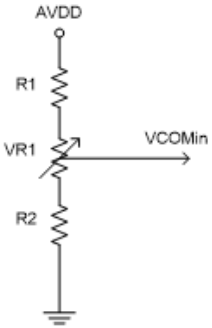
Note 2: Maximum ratings are those values beyond which damages to the device may occur. Functional operation should be restricted to the limits in the Electrical Characteristics chapter.

4. Electrical DC Characteristics

a. Typical Operation Condition (AGND =GND = 0V)

Item		Symbol	Min.	Typ.	Max.	Unit	Remark
Power Voltage		VDDIO	3.0	3.3	3.6	V	Digital Power Supply
		AVDD	11	11.5	12	V	Analog Power Supply
		VGH	20	21	22	V	Positive power supply for gate driver
		VGL	-7.5	-7	-6.5	V	Negative power supply for gate driver
Input Signal Voltage	H Level	VIH	0.7xVDDIO	--	VDDIO	V	
	L Level	VIL	GND	--	0.3xVDDIO	V	
VCOMin		V_{CDC}	3.85	4.35	4.85	V	Note 1

Note1:



b. Current Consumption (AGND=GND=0V)

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Input current for VDDIO	IVDDIO	VDDIO = 3.3V		9	15	mA	Note 1, 2
Input current for AVDD	IAVDD	AVDD = 11.5V		13	36	mA	Note 1, 2
Input current for VGH	IVGH	VGH = 21V	--	0.42	0.5	mA	Note 1, 2
Input current for VGL	IVGL	VGL = -7V	--	0.45	0.54	mA	Note 1, 2

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

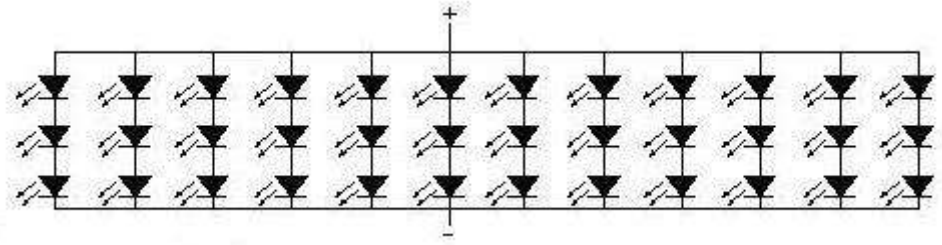
Note 2: Test pattern is White.

c. Backlight Driving Conditions

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

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
LED light bar Current	I_L	--	300	--	mA	
Power Consumption	P	--	3	3.21	W	Note 1
LED Life Time	L_L	10,000	--	--	Hr	Note 2, 3

Note 1: The LED driving condition is defined for LED module (36 LED). The Voltage range will be 8.8V to 10.7V based on suggested driving current set as 300mA.



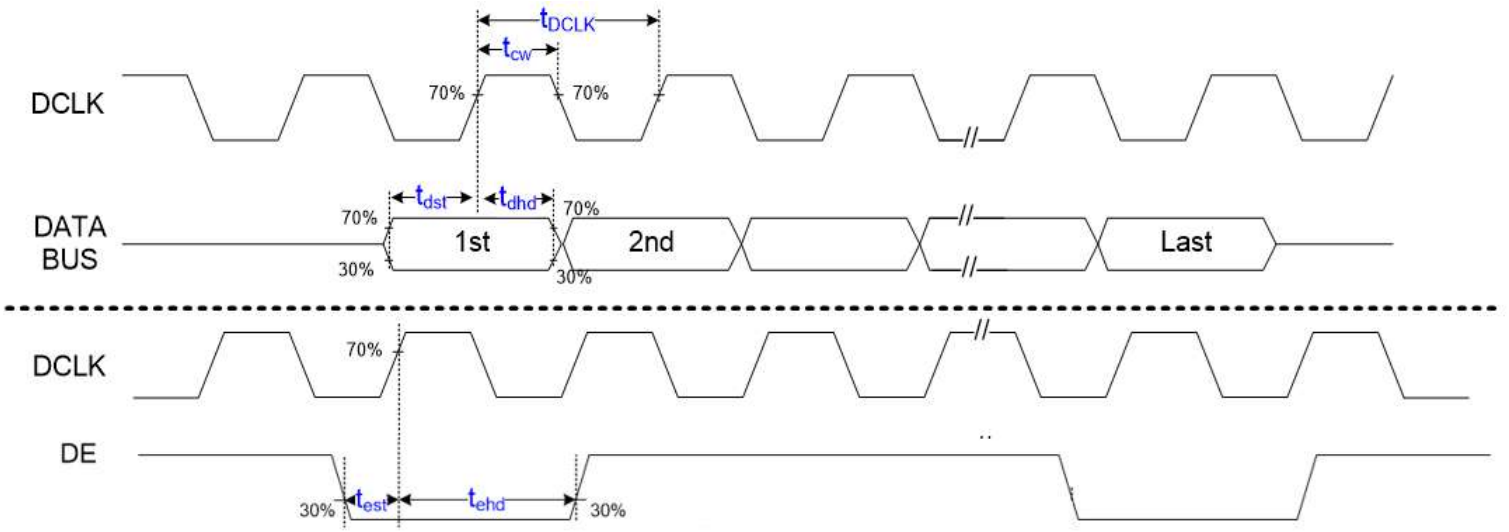
Note 2: Define “LED Lifetime”: brightness is decreased to 50% of the initial value. LED Lifetime is restricted under normal condition, ambient temperature = 25℃ and LED lightbar current = 300mA.

Note 3: If it uses larger LED lightbar current more than 300mA, it maybe decreases the LED lifetime.

5. Electrical AC Characteristics

a. Signal AC Characteristics

Parameter	Symbol	Min.	Typ.	Max.	Unit	Remark
DCLK duty cycle	--	40	50	60	%	t_{cw} / t_{DCLK} x100%
Data setup time	t_{dst}	5	--	--	ns	
Data hold time	t_{dhd}	5	--	--	ns	
DE setup time	t_{est}	5	--	--	ns	
DE hold time	t_{ehd}	5	--	--	ns	



t_{DCLK}: DCLK period

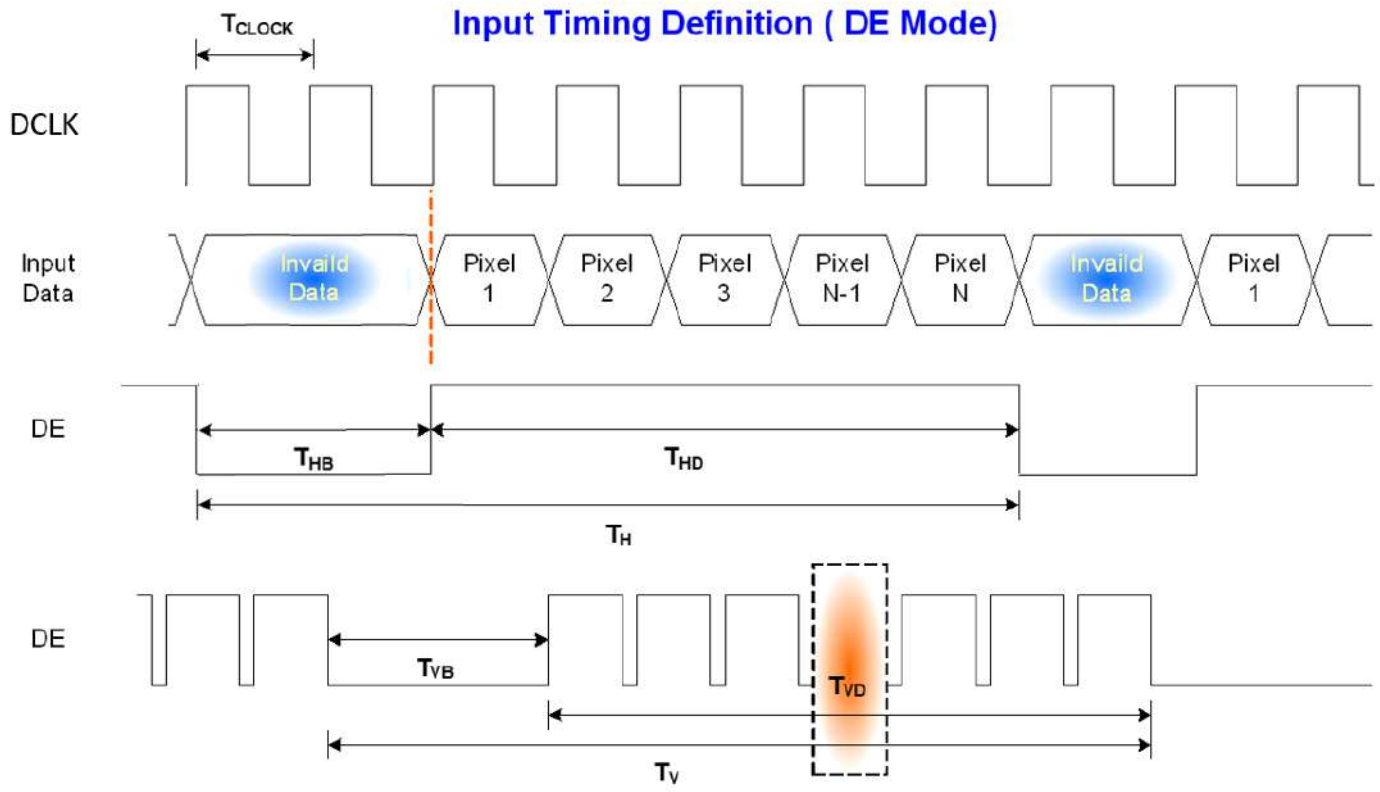
t_{cw}: the width of DCLK high

b. Timing Characteristics

Signal		Symbol	Min.	Typ.	Max.	Unit
Clock Frequency		1/ T_{Clock}	32.6	39.6	62.4	MHz
Horizontal Section	Period	T_H	890	1000	1300	Horizontal Section
	Active	T_{HD}	--	800	--	
	Blanking	T_{HB}	90	200	500	
Vertical Section	Period	T_V	749	660	800	Vertical Section
	Active	T_{VD}	--	600	--	
	Blanking	T_{VB}	10	60	200	
Frame Rate		F		60		Hz

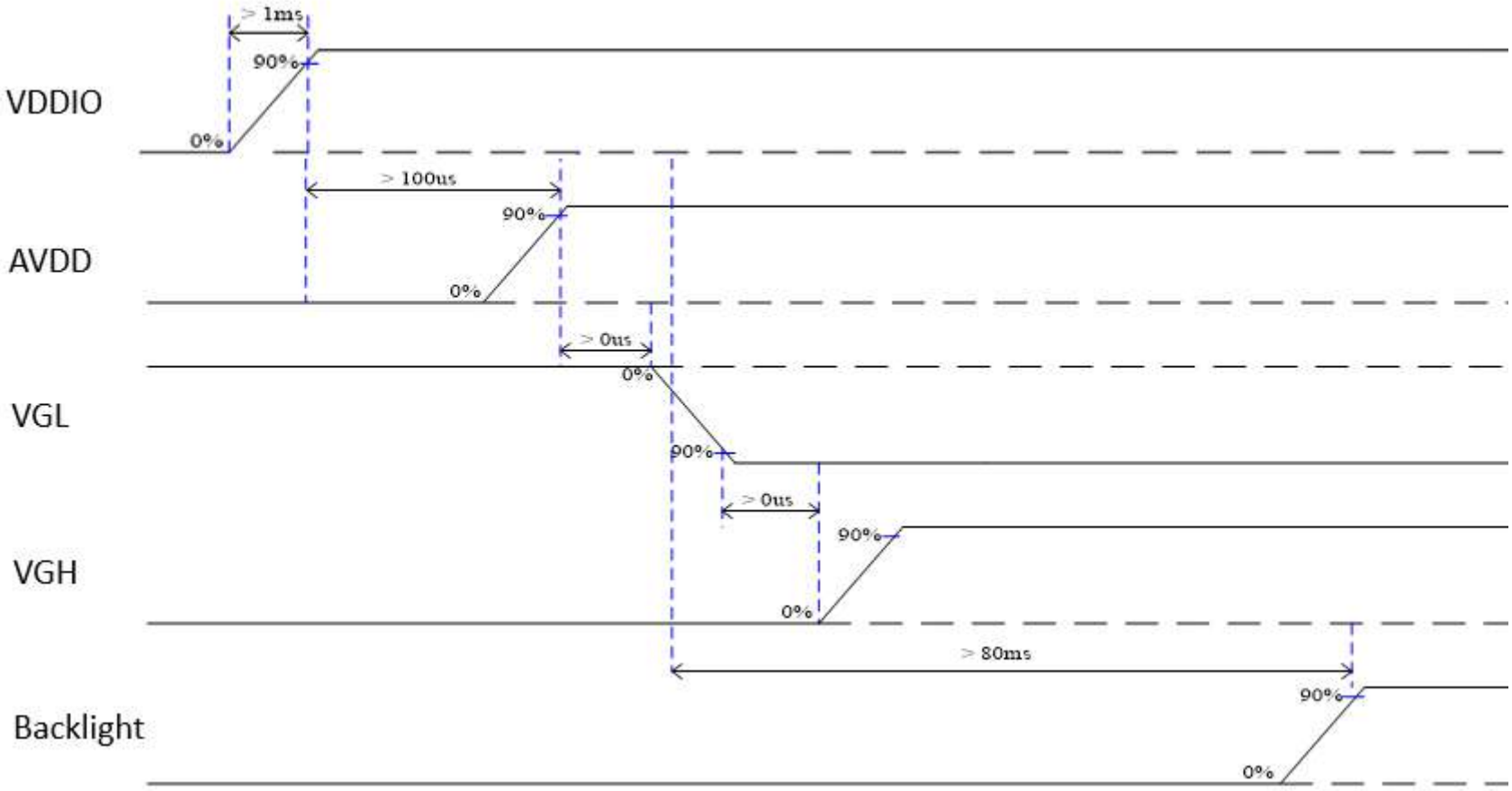
Note: DE mode.

c. Input Timing

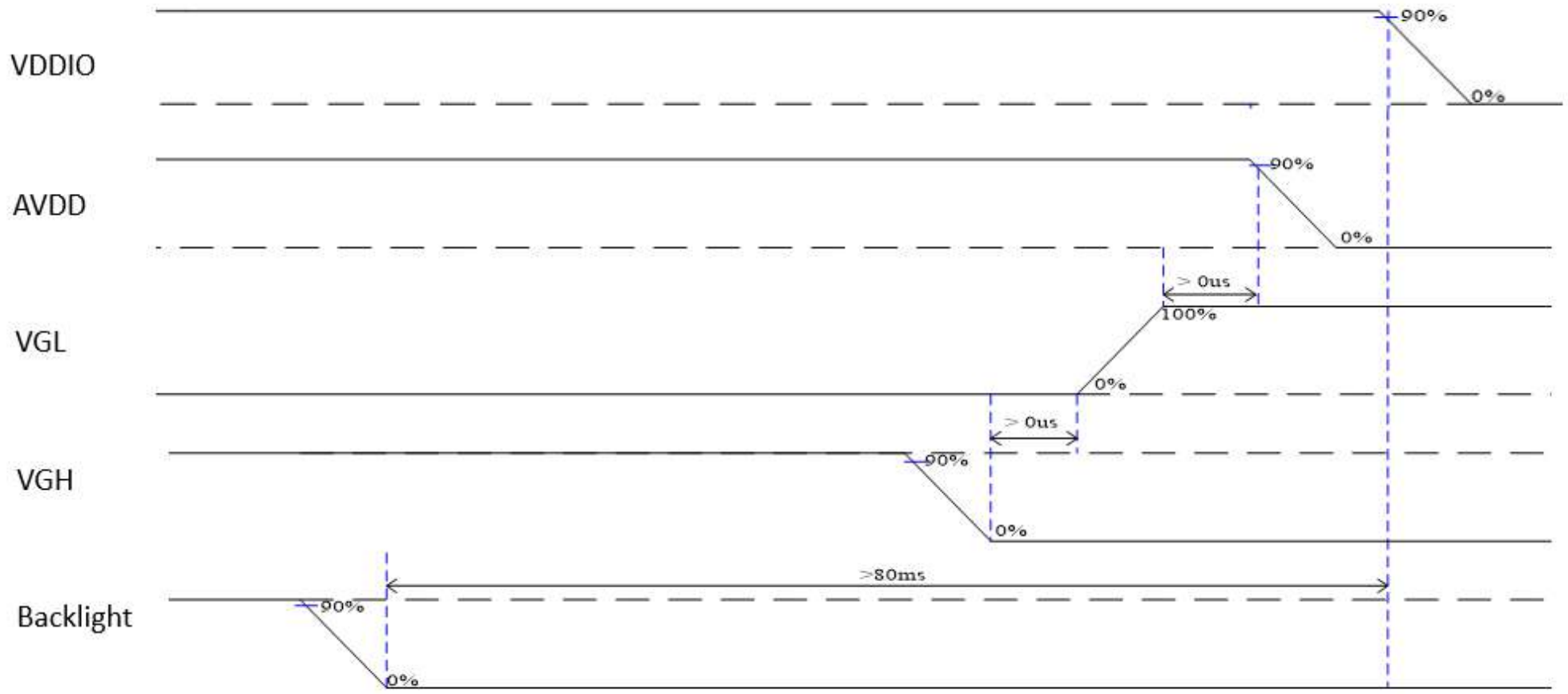


6. Power ON/OFF Sequence

a. Power On Sequence



b. Power Off Sequence



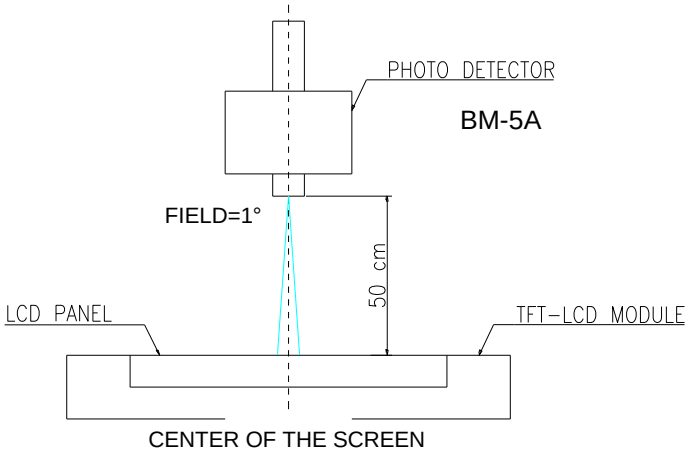
D. Optical Specification

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°	 -- --	 30	 7 33	 ms ms	Note 3
Contrast ratio		CR	At optimized viewing angle	400	500	--		Note 4
Viewing Angle	Top Bottom Left Right		CR≧10	40 50 65 65	50 60 75 75	-- -- -- --	deg.	Note 5
Brightness		Y_L	θ=0°	250	350	--	cd/m^2	Note 6
Chromaticity	White	X	θ=0°	0.256	0.306	0.356		
		Y	θ=0°	0.278	0.328	0.378		
	Red	X	θ=0°	0.543	0.593	0.643		
		Y	θ=0°	0.298	0.348	0.398		
	Green	X	θ=0°	0.290	0.340	0.390		
		Y	θ=0°	0.528	0.578	0.628		
	Blue	X	θ=0°	0.105	0.155	0.205		
		Y	θ=0°	0.068	0.118	0.168		
Uniformity		ΔY_L	%	75	80		--	Note 7

Note 1: Ambient temperature =25℃, and LED lightbar current I_L = 300mA. To be measured in the dark room.

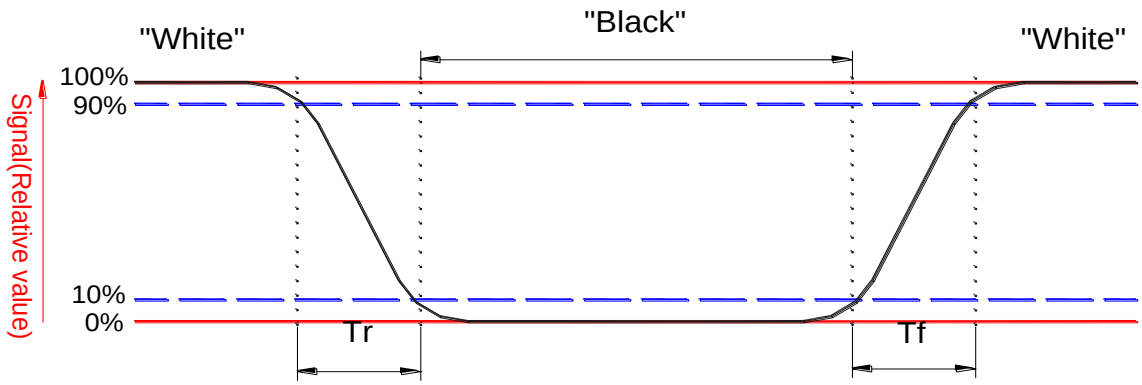
Note 2: To be measured on the center area of panel with a viewing cone of 1° by Topcon luminance meter BM-5A, after 15 minutes operation.



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.

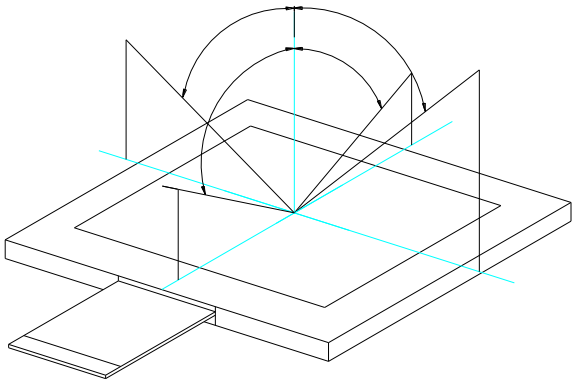


Note 4.Definition of contrast ratio:

Contrast ratio is calculated with the following formula.

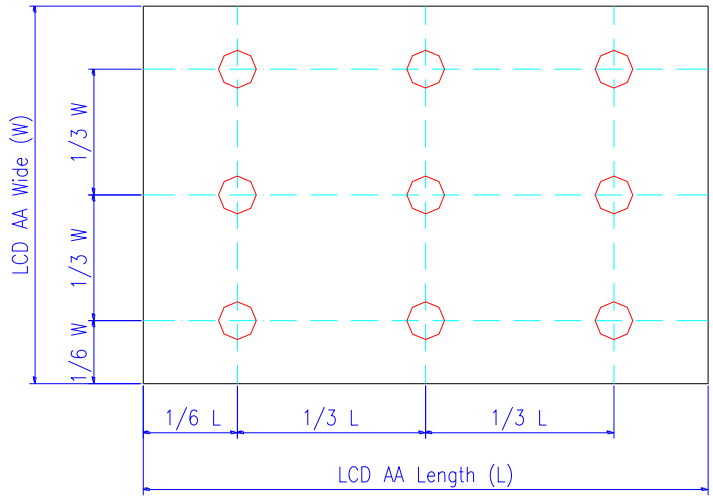
$$\text{Contrast ratio (CR)} = \frac{\text{Photo detector output when LCD is at "White" status}}{\text{Photo detector output when LCD is at "Black" status}}$$

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:



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

E. Reliability Test Items

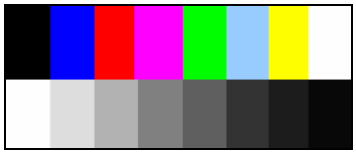
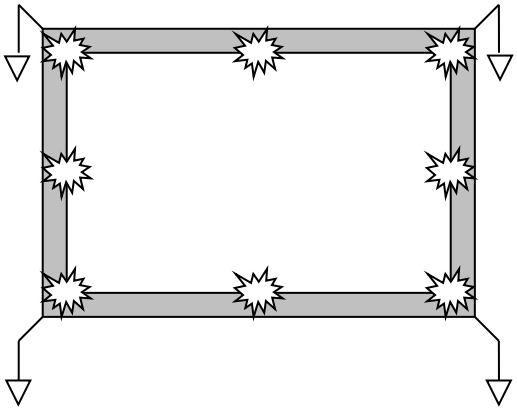
No.	Test items	Conditions	Remark
1	High Temperature Storage	Ta= 70℃ 240Hrs	
2	Low Temperature Storage	Ta= -20℃ 240Hrs	
3	High Ttemperature Operation	Tp= 60℃ 240Hrs	
4	Low Temperature Operation	Ta=-10℃ 240Hrs	
5	High Temperature & High Humidity	Tp= 50℃ 80% RH 240Hrs	Operation
6	Heat Shock	-10℃~60℃ 100 cycles 1Hrs/cycle	Non-operation
7	Electrostatic Discharge	Contact = ± 4 kV, class B Air = ± 8 kV, class B	Note 5
8	Image Sticking	25℃, 4hrs	Note 6
9	Vibration	Frequency range : 10~55Hz Stoke : 1.5mm Sweep : 10 ~ 55 ~ 10Hz 2 hours for each direction of X,Y,Z (6 hours for total)	Non-operation JIS C7021, A-10 condition A : 15 minutes
10	Mechanical Shock	100G . 6ms, ±X,±Y,±Z 3 times for each direction	Non-operation JIS C7021, A-7 condition C
11	Vibration (With Carton)	Random vibration: $0.015G^2$/Hz from 5~200Hz –6dB/Octave from 200~500Hz	IEC 68-34
12	Drop (With Carton)	Height: 60cm 1 corner, 3 edges, 6 surfaces	
13	Pressure	5kg, 5sec	Note 7

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

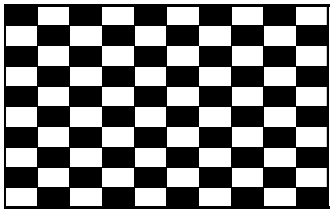
Note 2: In the standard conditions, there is not display function NG issue occurred. All the cosmetic specification is judged before the reliability stress.

Note 3: All the cosmetic specification is judged before the reliability stress.

Note5 : All test techniques follow IEC6100-4-2 standard.

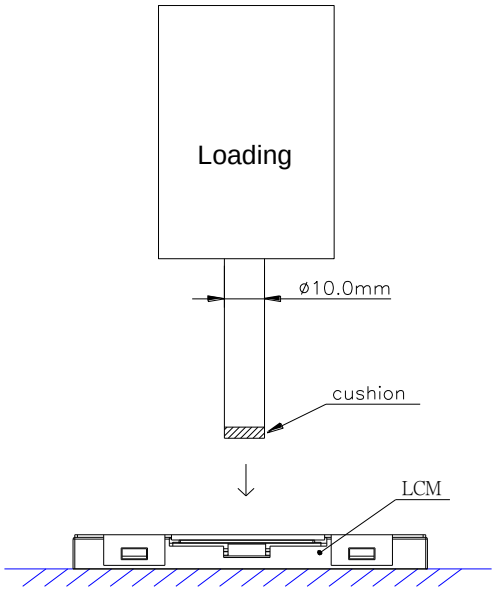
Test Condition		Note
Pattern		
Procedure And Set-up	Contact Discharge：330Ω, 150pF, 1sec, 8 point, 10times/point Air Discharge：330Ω, 150pF, 1sec, 8 point, 10times/point 	
Criteria	B – Some performance degradation allowed. No data lost. Self-recoverable hardware failure.	

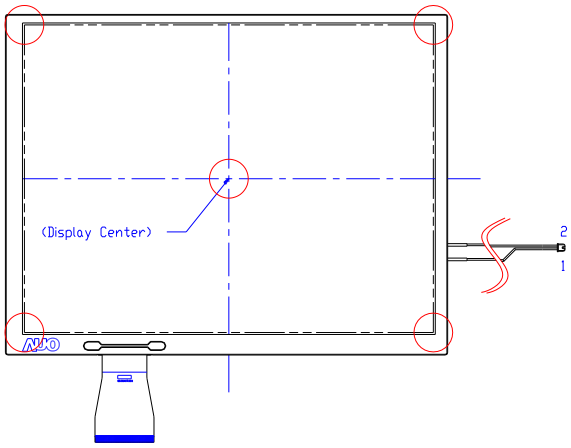
Note 6: Operate with chess board pattern as figure and lasting time and temperature as the conditions. Then judge with 50% gray level, the mura is less than JND 2.5

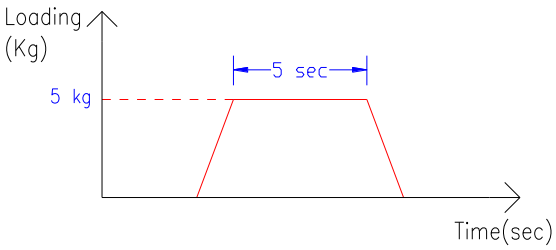


Note 7: The panel is tested as figure. The jig isψ10 mm made by Cu with rubber and the loading speed is 3mm/min on position A~E. After the condition, no glass crack will be found and panel function check is OK.(no guarantee LC mura、LC bubble)

Note 8. In Reliability test, performance is confirmed after leave in room temperature

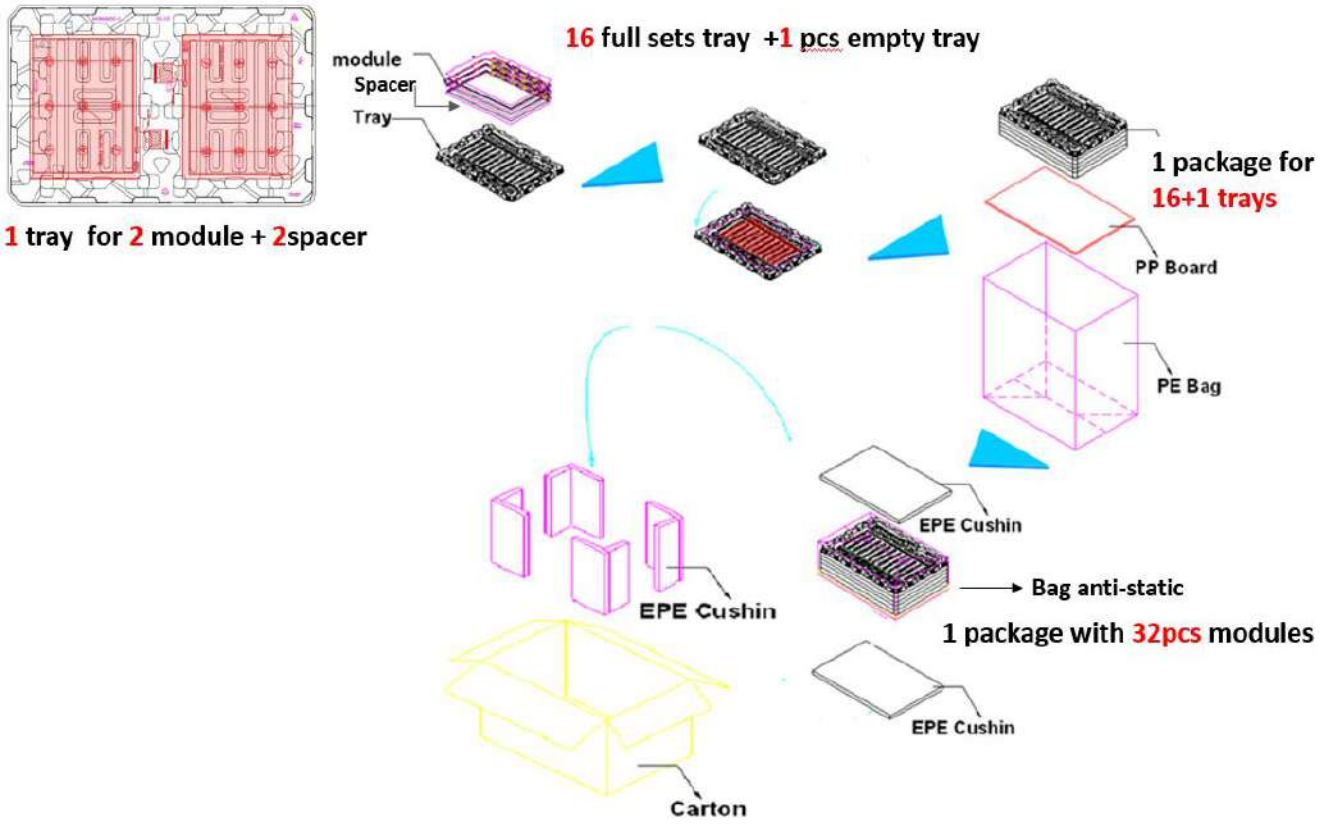






F. Packing and Marking

1. Packing Form



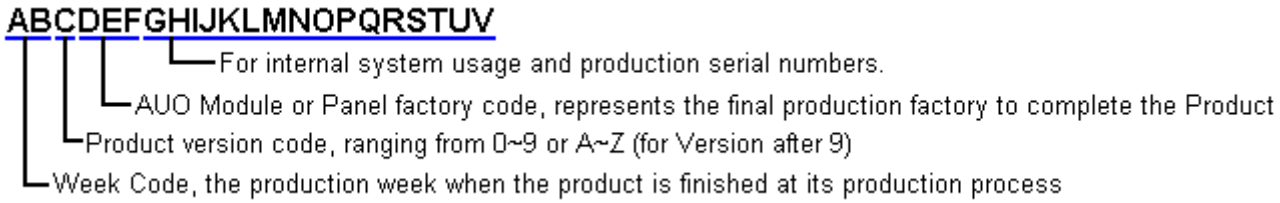
MAX.CAPACITY : 32 MODULES

MAX.WEIGHT : 16.159kg

CARTON Dim : 544(L)* 374(W)* 376(H)mm

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 and printed with code 39/128 with the following definition:



Example:

501M06ZL06123456781Z05:

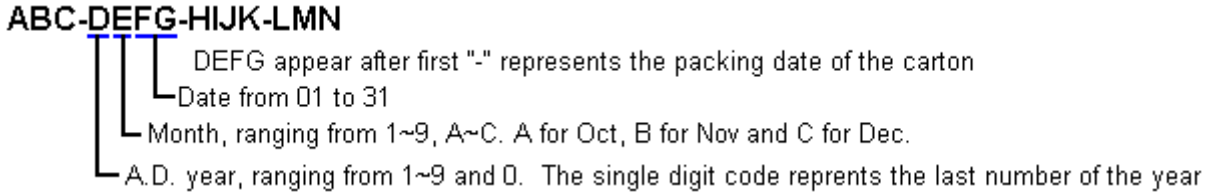
Product Manufacturing Week Code: WK50

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.

G. 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.
22. Please use SSCG(Spread Spectrum Clock Generator) at system for EMI reduction.