

SPECIFICATION FOR APPROVAL

DESCRIPTION: 4.3 LCD Module

CUSTOMER: _____

Product No: BR043WBI1028-A3ST401

Released Date: 2021.03.21

Revision: 1.0

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APPROVED SIGNATURES			

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2 General Specifications

	Feature	Spec
Characteristics	LCD Size	4.3 inch
	Display Format	800 (RGB) ×480
	Interface	24-bit RGB
	Color Depth	16.7M
	Technology type	a-Si
	Pixel Pitch	0.1188 x 0.1122
	Display Mode	Normally Black
	Driver IC	
	Surface Treatment	HC
	Viewing Direction	ALL
	Gray Viewing Direction	FREE
Mechanical	LCM (W x H x D) (mm)	105.50*67.2*2.9
	Active Area(mm)	95.04 x 53.856
	With /Without TSP	Without TSP
	Weight (g)	TBD
	LED Numbers	10 LEDs

Note 1: Viewing direction is following the data which measured by optics equipment.

Note 2: Requirements on Environmental Protection: RoHS

Note 3: LCM weight tolerance: +/- 5%

3 Input/Output Terminals

No.	Symbol	Description
1	VBL-	Backlight LED Cathode
2	VBL+	Backlight LED Anode.
3	GND	System Ground
4	VCC	Power supply for logic operation
5~12	R0~R7	Data bus
13~20	G0~G7	Data bus
21~28	B0~B7	Data bus
29	GND	System Ground
30	CLK	Pixel clock signal
31	DISP	Display on/off control
32	HSYNC	Horizontal Sync signal
33	VSYNC	Vertical Sync signal
34	DEN	Data Enable
35	NC	No connect
36	GND	System Ground
37	NC/XR	No connect
38	NC/YD	No connect
39	NC/XL	No connect
40	NC/YU	No connect

4 Absolute Maximum Ratings

Item	Symbol	MIN	MAX	Unit	Remark
Supply Voltage	V _{DD}	-0.3	5.8	V	
Operating Ambient Humidity	HOP	10	*4	*3	
Storage Humidity	HST	10	*4	*3	
Operating Temperature	T _{OPR}	-20	70	°C	
Storage Temperature	T _{STG}	-30	80	°C	

Note:

*1. At 25 ± 5°C

*2. Due to the characteristics of LC Material, the Liquid Crystal driving voltage varies with environmental temperature.

*3. Non-condensation.

*4. Temp. ≤ 60, 90%RH Max. °C

Temp. > 60, Absolute humidity shall be less than 90%RH.

5 Electrical Characteristics

5.1 Operating conditions:

Item	Symbol	Min.	Typ.	Max.	Unit	Note
TFT Gate ON Voltage	V _{GH}	--	(15)	--	V	*1,*2
TFT Gate OFF Voltage	V _{GL}	--	(-10)	--	V	
TFT Common Voltage	V _{com}	(3.1)	--	(5.1)	V	
Data (RGB signal) Voltage	V _{sig}	(0.2)	--	(11.8)	V	

Note:

*1. V_{GH} is TFT Gate operating Voltage.

*2. V_{GL} is TFT Gate operating Voltage.

The storage structure of this model is C_{ST}(Storage on Common)

*3. V_{com} must be adjusted to optimize display quality _Cross talk, Contrast Ratio and etc.

5.2 Driving Backlight

Item	Symbol	MIN	TYP	MAX	Unit	Remark
LED current	I_F	35	40	50	mA	Note 1 Note 2,3
Power Consumption					mW	
LED Voltage	V_F	15.5	16.0	16.5	V	
LED Life Time	W_{BL}	25000	-	-	Hr	

Note 1 : There are 2 Groups LED

Note 2 : $T_a = 25^{\circ}\text{C}$

Note 3 : Brightness to be decreased to 50% of the initial value

6 Interface Timing

6.1 AC electrical characteristics

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
HS setup time	T_{hst}	8	-	-	ns
HS hold time	T_{hhd}	8	-	-	ns
VS setup time	T_{vst}	8	-	-	ns
VS hold time	T_{vhd}	8	-	-	ns
Data setup time	T_{dsu}	8	-	-	ns
Data hold time	T_{dhd}	8	-	-	ns
DE setup time	T_{esu}	8	-	-	ns
DE hold time	T_{ehd}	8	-	-	ns
VDD Power On Slew rate	T_{POR}	-	-	20	ms
RSTB pulse width	T_{Rst}	10	-	-	us
CLKIN cycle time	T_{ckh}	20	-	-	ns
CLKIN pulse duty	T_{cwh}	40	50	60	%
Output stable time	T_{sst}	-	-	6	us

6.2 Data input format

● Horizontal timing

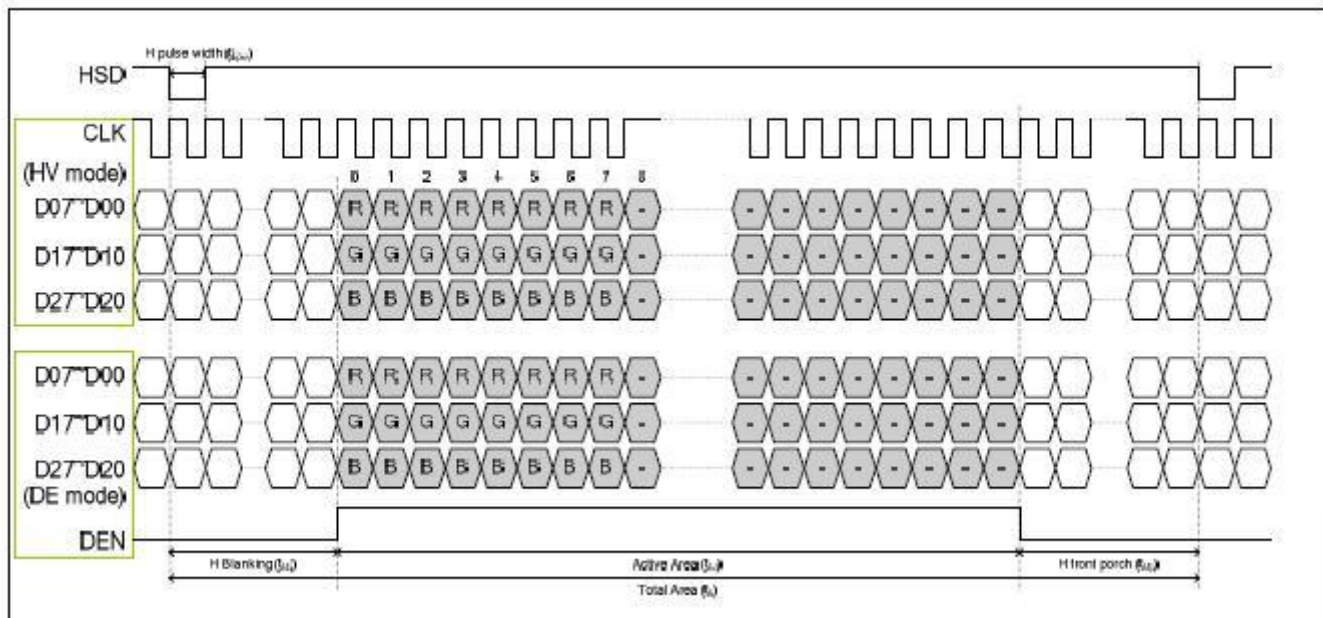


Figure 9.1 Horizontal Input Timing Diagram

● Vertical timing

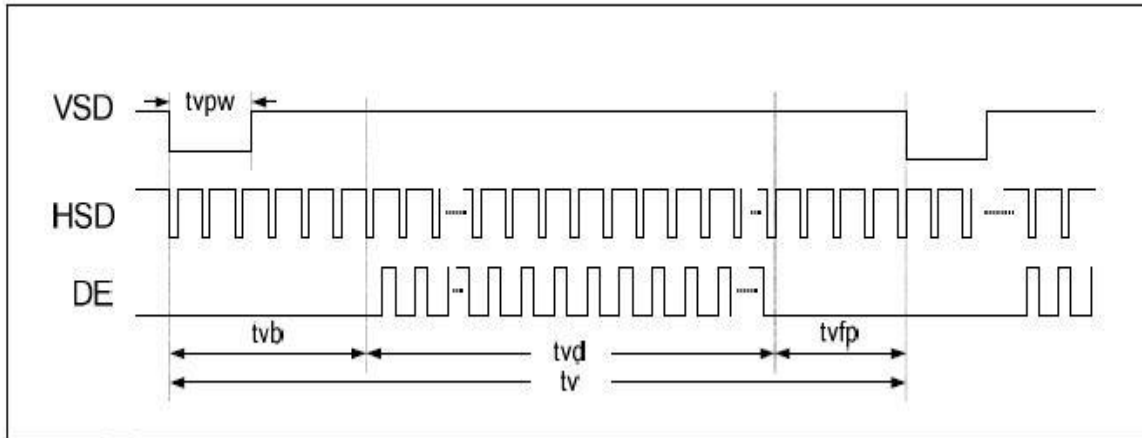


Figure 9.2 Vertical Input Timing Diagram

6.3 Resolution: 800x480

● Horizontal timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Horizontal Display Area	thd		800		DCLK
DCLK frequency	fclk	-	30	50	MHz
One Horizontal Line	th	889	928	1143	DCLK
HS pulse width	thpw	1	48	255	DCLK
HS Back Porch (Blanking)	thb		88		DCLK
HS Front Porch	thfp	1	40	255	DCLK
DE mode Blanking	th-thd	85	128	512	DCLK

● Vertical timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd		480		T _H
VS period time	tv	513	525	767	T _H
VS pulse width	tvpw	3	3	255	T _H
VS Back Porch (Blanking)	tvb		32		T _H
VS Front Porch	tvfp	1	13	255	T _H
DE mode Blanking	tv-tvd	4	45	255	T _H

6.4 Timing diagram

Input clock and data timing waveform

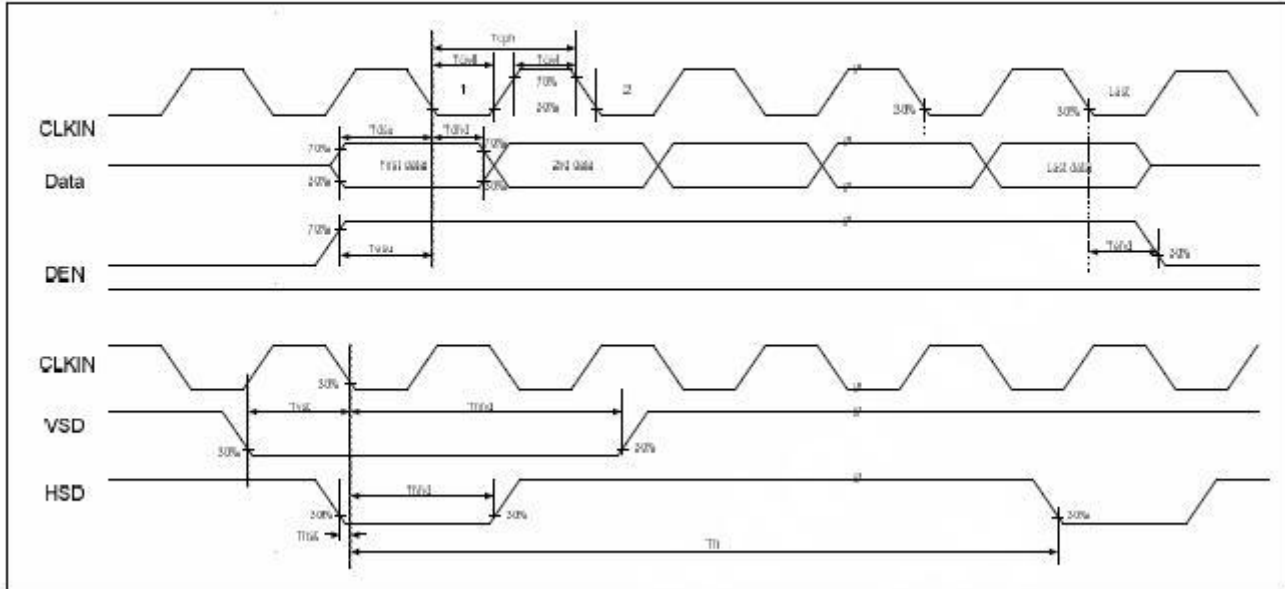


Figure 10. 1 Input Clock and Data Timing Diagram

7 Optical Characteristics

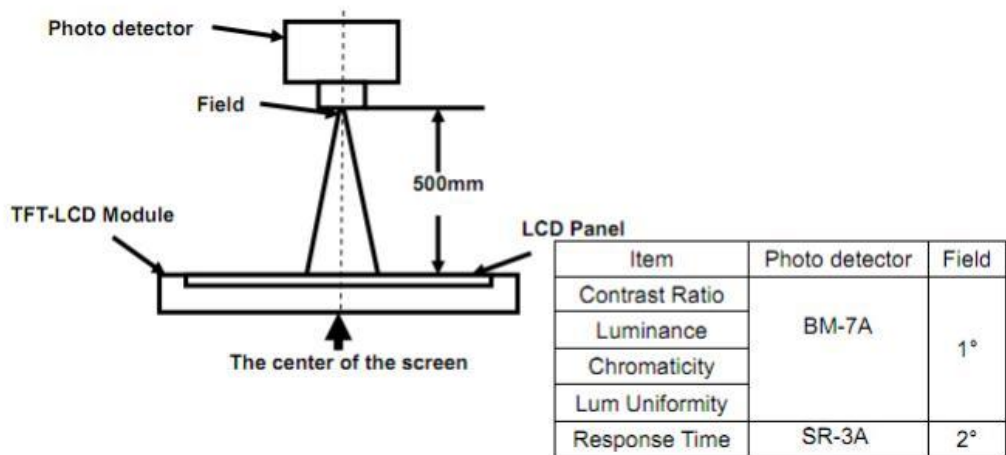
Items	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark	
Viewing angles	θ_T	Center CR \geq 10	-	80	-	Degree.	Note2	
	θ_B		-	80	-			
	θ_L		-	80	-			
	θ_R		-	80	-			
Contrast Ratio	CR	$\Theta = 0$	640	800	-	-	Note1, Note3	
Response Time	T _{ON}	25° C	-	30	45	ms	Note1, Note4	
	T _{OFF}		-	30	45			
Chromaticity	White	Backlight is on	X _W	0.282	0.312	0.342	-	Note1, Note5
			Y _W	0.319	0.349	0.379	-	
	Red		X _R	0.609	0.639	0.669	-	
			Y _R	0.314	0.344	0.374	-	
	Green		X _G	0.264	0.294	0.324	-	
			Y _G	0.557	0.587	0.617	-	
	Blue		X _B	0.102	0.132	0.162	-	
			Y _B	0.106	0.136	0.166	-	
Uniformity	U		13.5	15	-	%	Note1, Note6	
NTSC				50		%	Note5	
Luminance	L		270	300			Note1, Note7	

Test Conditions:

1. IF= 20mA(one channel),the ambient temperature is 25°C.
2. The test systems refer to Note 1 and Note 2.

Note 1: Definition of optical measurement system.

The optical characteristics should be measured in dark room. After 5 minutes operation, the optical Properties are measured at the center point of the LCD screen. All input terminals LCD panel must be ground when measuring the center area of the panel.



Note 2: Definition of viewing angle range and measurement system.

Viewing angle is measured at the center point of the LCD by CONOSCOPE (ergo-80).

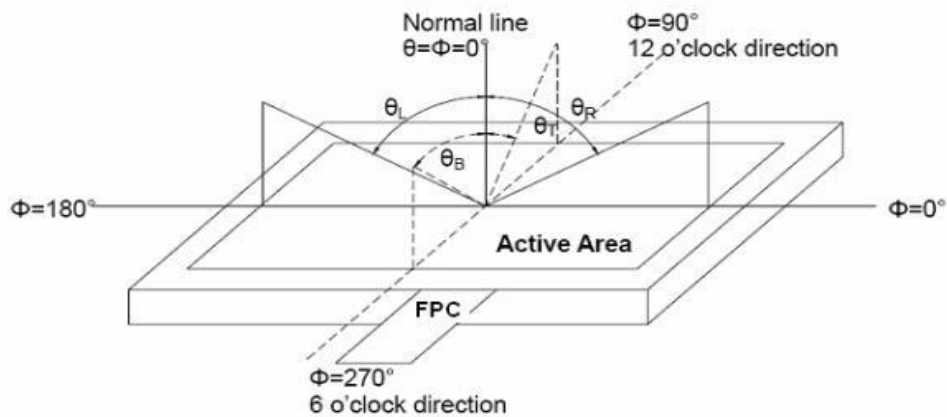


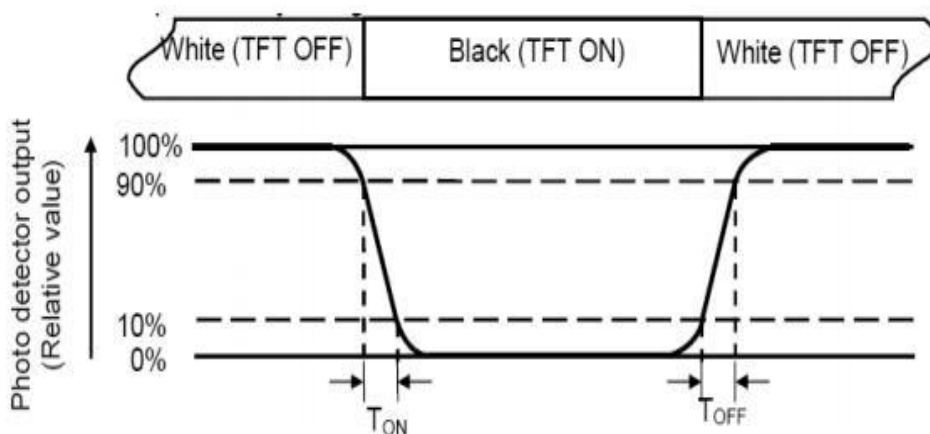
Fig. 1 Definition of viewing angle

Note 3: Definition of contrast ratio

$$\text{Contrast ratio (CR)} = \frac{\text{Luminance measured when LCD is on the "White" state}}{\text{Luminance measured when LCD is on the "Black" state}}$$

Note 4: Definition of Response time

The response time is defined as the LCD optical switching time interval Between "White" state and "Black" state. Rise time (TON) is the time between Photo detector output intensity changed from 90% to 10%. And fall time (TOFF) is The time between photo detector output intensity changed from 10% to 90%



Note 5: Definition of color chromaticity (CIE1931)

Color coordinates measured at center point of LCD.

Note 6: Definition of Luminance Uniformity

Active area is divided into 9 measuring areas (Refer Fig. 2). Every measuring point is placed at the Center of each measuring area

Luminance Uniformity (U) = $L_{min} / L_{max} \times 100\%$

L-----Active area length W----- Active area width

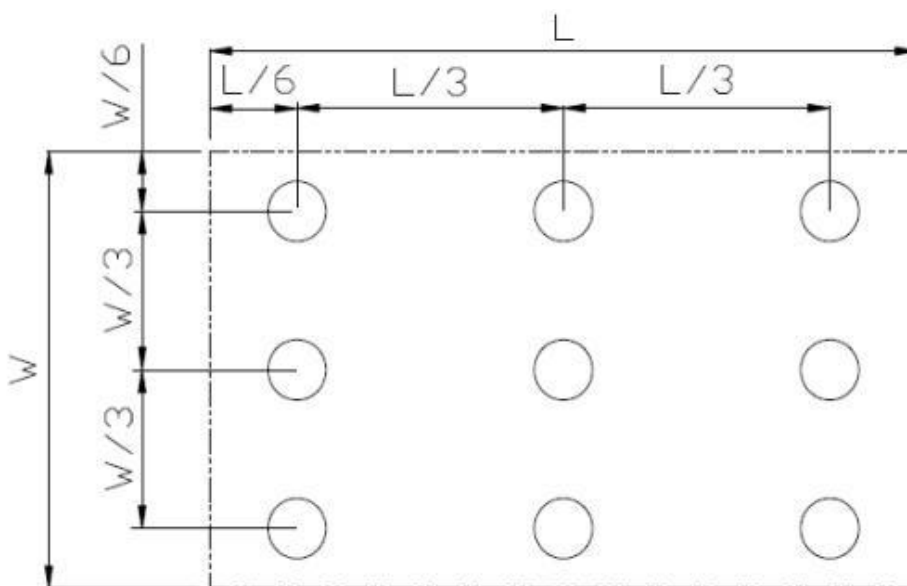


Fig. 2 Definition of uniformity

L_{max} : The measured maximum luminance of all measurement position.

L_{min} : The measured minimum luminance of all measurement position.

Note 7: Definition of Luminance:

Measure the luminance of white state at center point.

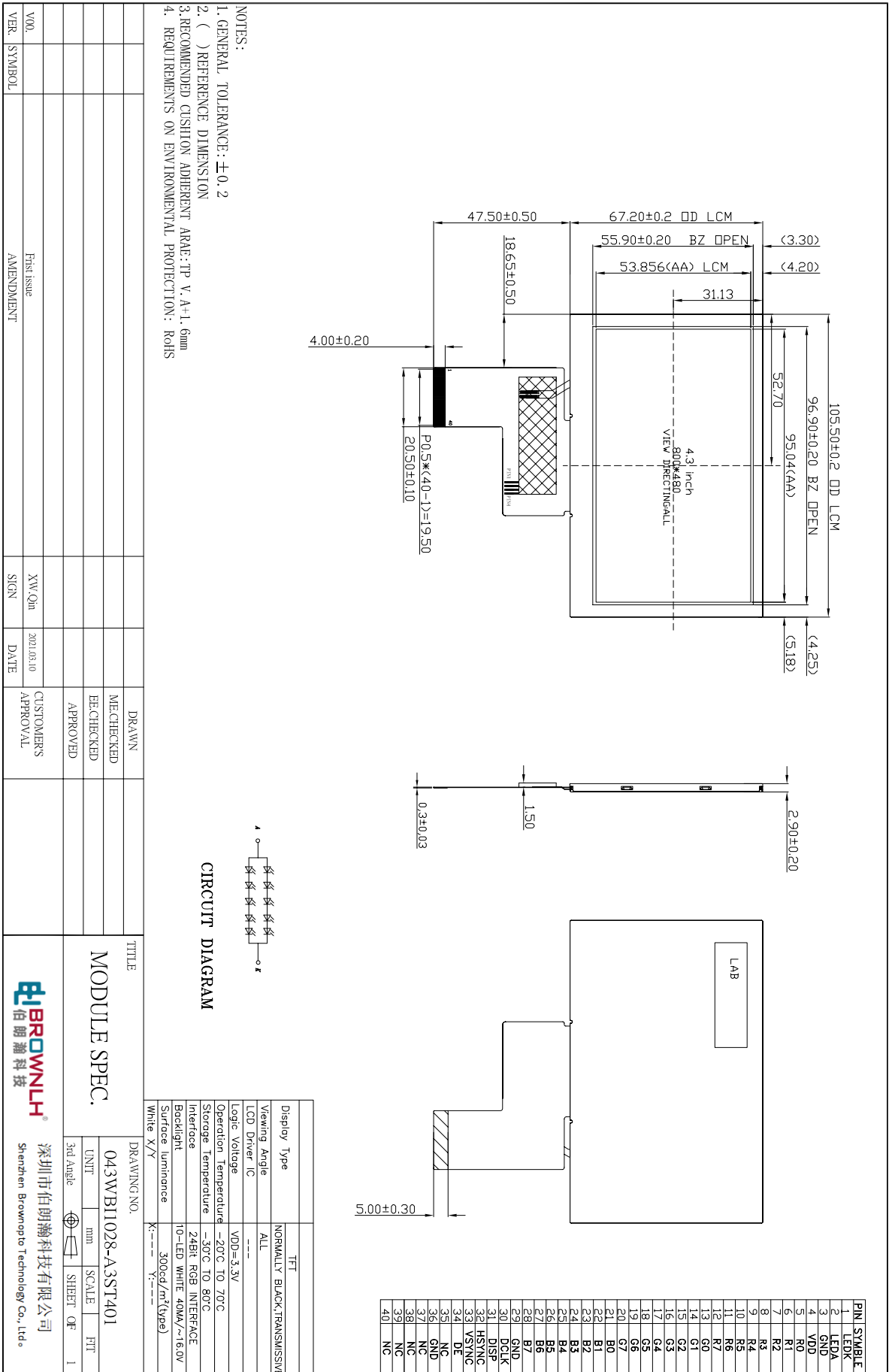
8 Environmental / Reliability Tests

No	Test Item	Condition	Remarks
1	High Temperature Operation	T _s = +70°C, 96hrs	Note 1 IEC60068-2-2, GB2423. 2-89
2	Low Temperature Operation	T _a = -20°C, 96hrs	Note 2 IEC60068-2-1 GB2423.1-89
3	High Temperature Storage	T _a = +80°C, 96hrs	IEC60068-2-2 GB2423. 2-89
4	Low Temperature Storage	T _a = -30°C, 96hrs	IEC60068-2-1 GB/T2423.1-89
5	High Temperature & Humidity Storage	T _a = +60°C, 90% RH max, 96 hours	IEC60068-2-3 GB/T2423.3-2006
6	Thermal Shock (Non-operation)	-30°C 30 min ~ +80°C 30 min Change time: 5min, 30 Cycle	Start with cold temperature, end with high temperature IEC60068-2-14, GB2423.22-87
7	Electro Static Discharge (Operation)	C=150pF, R=330 Ω, 5 points/panel Air:±8KV, 5 times; Contact: ±4KV, 5 times; (Environment: 15°C ~ 35°C, 30% ~ 60%, 86Kpa ~ 106Kpa)	IEC61000-4-2 GB/T17626.2-1998
8	Vibration (Non-operation)	Frequency range: 10~55Hz, Stroke: 1.mm Sweep: 10Hz~55Hz~10Hz 2 hours for each direction of X .Y. Z. (package condition)	IEC60068-2-6 GB/T2423.5-1995
9	Shock (Non-operation)	60G 6ms, ± X, ±Y , ± Z 3 times for each direction	IEC60068-2-27 GB/T2423.5-1995
10	Package Drop Test	Height: 60 cm, 1 corner, 3 edges, 6 surfaces	IEC60068-2-32 GB/T2423.8-1995

Note: 1. T_s is the temperature of panel's surface.

2. T_a is the ambient temperature of sample.

9 Mechanical Drawing

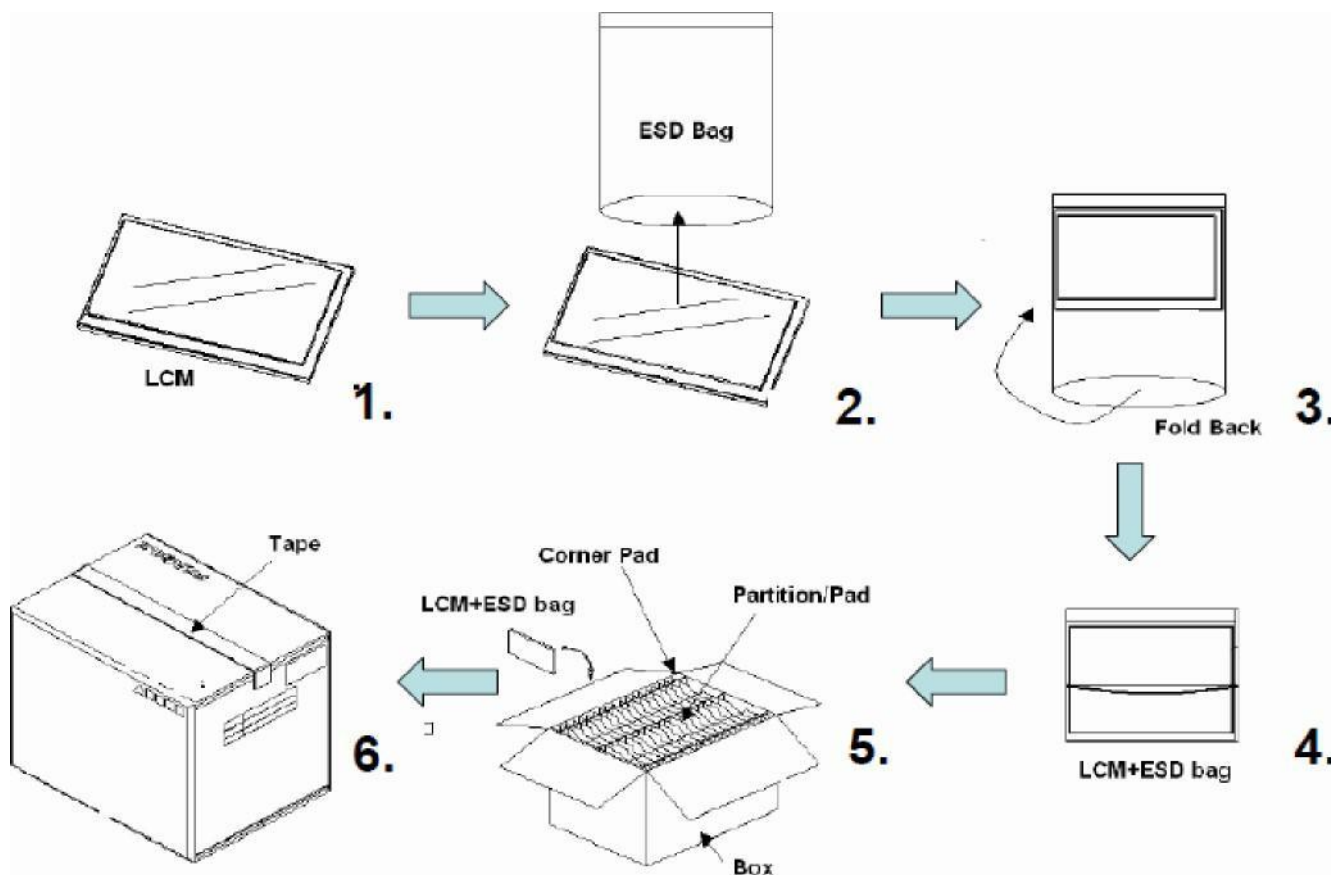


11.0 PACKAGE SPECIFICATION

11.1 Packing form

LCM Model	LCM Qty. in the box	Inner Box Size (mm)	Note
043WBI1028-A3ST401	200 pcs/box	490±5 x 340±5 x 250±5	

11.2 Packing assembly drawings



Items	Material	Notice
Box	Corrugated Paper Board	AB Flute
Partition/Pad	Corrugated Paper Board	B Flute
Corner Pad	Corrugated Paper Board	AB Flute
ESD bag	PE	

11. Precautions for Use of LCD modules

11.1 Handling Precautions

11.1.1. The display panel is made of glass. Do not subject it to a mechanical shock by dropping it from a high place, etc.

11.1.2. If the display panel is damaged and the liquid crystal substance inside it leaks out, be sure not to get any in your mouth, if the substance comes into contact with your skin or clothes, promptly wash it off using soap and water.

11.1.3. Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary.

11.1.4. The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully.

11.1.5. If the display surface is contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If still not completely clear, moisten cloth with one of the following solvents:

- Isopropyl alcohol
- Ethyl alcohol

Solvents other than those mentioned above may damage the polarizer. Especially, do not use the following:

Water ; Ketene ; Aromatic solvents

11.1.6. Do not attempt to disassemble the LCD Module.

11.1.7. If the logic circuit power is off, do not apply the input signals.

11.1.8. To prevent destruction of the elements by static electricity, be careful to maintain an optimum work environment.

11.1.8.1. Be sure to ground the body when handling the LCD Modules.

11.1.8.2. Tools required for assembly, such as soldering irons, must be properly ground.

11.1.8.3. To reduce the amount of static electricity generated, do not conduct assembly and other work under dry conditions.

11.1.8.4. The LCD Module is coated with a film to protect the display surface. Be care when peeling off this protective film since static electricity may be generated.

11.2 Storage Precautions

11.2.1. When storing the LCD modules, avoid exposure to direct sunlight or to the light of fluorescent lamps.

11.2.2. The LCD modules should be stored under the storage temperature range. If the LCD modules will be stored for a long time, the recommend condition is:

Temperature : 0°C ~ 40°C Relatively humidity: ≤80%

11.2.3. The LCD modules should be stored in the room without acid, alkali and harmful gas.

11.3 Transportation Precautions

The LCD modules should be no falling and violent shocking during transportation, and also should avoid excessive press, water, damp and sunshine.