



深圳市百乐奇科技有限公司
SHENZHENSHI BAILEQI TECHNOLOGY CO., LTD



Product Specification

产品规格书

Y12200B00N

1. 22" 240(H) *3(RGB)*204(V)* TFT LCD

JAN,13, 2018

Customer: _____

Customer Approval and Feedback

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Table of Contents

REVISION HISTORY	3
1. GENERAL DESCRIPTION	4
1.1 DESCRIPTION	4
1.2 GENERAL INFORMATION	4
2. ABSOLUTE MAXIMUM RATING	5
3. ELECTRICAL CHARACTERISTICS	6
3.1 LCM DC CHARACTERISTICS	6
3.2 BACK-LIGHT UNIT CHARACTERISTICS	6
4. OPTICAL CHARACTERISTICS	7
5. MODULE OUTLINE DIMENSION	10
6. MODULE INTERFACE DESCRIPTION	11
7. REFERENCE APPLICATION CIRCUIT	12
8. TIMINGS FOR MPU Interface	12
9. RELIABILITY TEST CONDITIONS	13
10. PACKING	14
11. INSPECTION CRITERION	15
12. GENERAL PRECAUTIONS	18

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1. GENERAL DESCRIPTION

1.1 DESCRIPTION

Y12200B00N is a transmissive type color active matrix TFT (Thin Film Transistor) liquid crystal display (LCD) that uses amorphous silicon TFT as a switching device. This model is composed of a TFT-LCD module (TFT-LCD panel, driver IC and FPC), a back-light unit and. The resolution of 1.22" contains 240 RGB X204 pixels and can display up to 65K colors.

1.2 GENERAL INFORMATION

Items	Specification	Unit	Note
Display mode	TFT Transmissive, Positive, NB, IPS	-	-
Drive element	a-Si TFT active matrix	-	-
LCM outline size	33.66(H) x 33.02(V) x 1.45(T)	mm	Note (1)(2)
Active area	30.96(H)X26.316(V)	mm	-
Number of pixels	240*3RGB(H)*204(V)	pixels	-
Pixel arrangement	RGB stripe	-	-
Pixel size	0.043(W) x 0.129 (H)	mm	-
Display color	262K	color	-
Viewing direction	ALL viewing	-	-
Controller / Driver	ST7789V-G4	-	-
Data interface	4 Wire 8bit Data	-	
Backlight	2 White LEDs In Parallels	-	
Weight	TBD	g	

Notes:

- (1) back-light unit are included.
- (2) FPC no included. (Refer to the module outline dimension for further information). Please see module specification drawing in Page14 for more details.



2. ABSOLUTE MAXIMUM RATING

(Ta=25±2°C, Vss=GND=0V)

Characteristics	Symbol	Min.	Max.	Unit	Notes
TFT Gate On voltage	VGH	12	21	V	
TFT Gate Off voltage	VGL	-12.5	-7v	V	
TFT common voltage	VCOM	4.0	5.5	V	
Backlight Forward Current	I _F	-	30	mA	
Operating Temperature	T _{OPR}	-20	+70	°C	(1), (3)
Storage Temperature	T _{STG}	-30	+80	°C	(2), (3)
Humidity	RH	-	90	%	Max. 60 °C

Notes:

- (1) In case of below 0°C, the response time of liquid crystal (LC) becomes slower and the color of panel becomes darker than normal one. Level of retardation depends on temperature, because of the LC characteristics.
- (2) If product is exposed to high temperatures for extended time, there is a possibility of the polarizer film damage which could degrade the optical characteristics.
- (3) Permanent damage to the device may occur if maximum values are exceeded or reverse voltage is loaded.
Functional operation should be restricted to the conditions described under normal operating conditions.

3. ELECTRICAL CHARACTERISTICS

3.1 LCM DC CHARACTERISTICS

(Ta=25±2°C)

Characteristics	Symbol	Min.	Typ.	Max.	Unit	Note
Power Supply Voltage 1	VCI	2.6	2.8	3.3	V	
Power Supply Voltage 2	VDDI	1.65	2.8	3.3	V	
Power Supply for MTP	VPP	-	-	-	V	
Current Consumption	I _{DD}	-	2	-	mA	Normal mode
	I _{DD-SLEEP}		TBD		uA	Sleep mode
Input voltage "L" Level	V _{IL}	GND	-	0.3IOVCC	V	IOVCC=1.65~3.3
Input voltage "H" Level	V _{IH}	0.7IOVCC	-	IOVCC	V	
Output voltage "L" Level	V _{OL}	0	-	0.2IOVCC	V	I _{OL} =1mA
Output voltage "H" Level	V _{OH}	0.8IOVCC	-	IOVCC	V	I _{OH} =-1mA

3.2 BACK-LIGHT UNIT CHARACTERISTICS

The back-light system is an edge-lighting type with 2 white LEDs. The characteristics of the back-light are shown in the following tables.

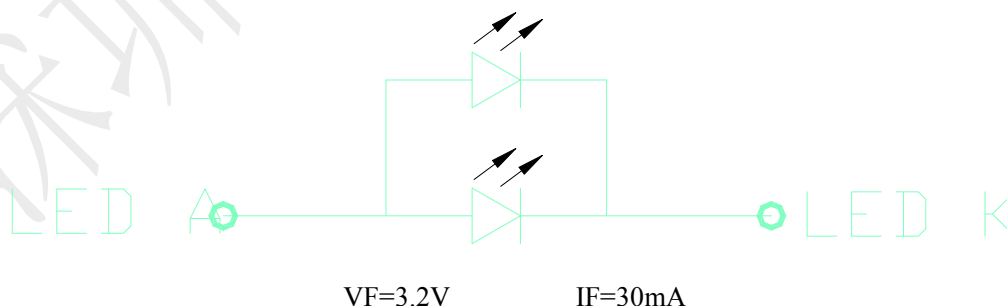
(Ta=25±2°C)

Characteristics	Symbol	Condition	Min.	Type	Max.	Unit	Notes
Forward Voltage	V _f	I _L =30mA	2.8	3.0	3.2	V	-
Forward current	I _L		--	30	-	mA	-
Luminance	L _v	I _L =30mA	2000	-	--	cd/m ²	-
LED life time	-	I _L =30mA	-	15,000	--	Hr	Note 1

Note:

- (1) The "LED life time" is defined as the module brightness decrease to 50% of original brightness at I_L=30mA. The LED life time could be decreased if operating I_L is larger than 30mA.

Backlight circuit diagram shown in below:



4. OPTICAL CHARACTERISTICS



The following items are measured under stable conditions. The optical characteristics should be measured in a dark room.

Measuring equipment: BM-5AS, BM-7, EZ-Contrast.

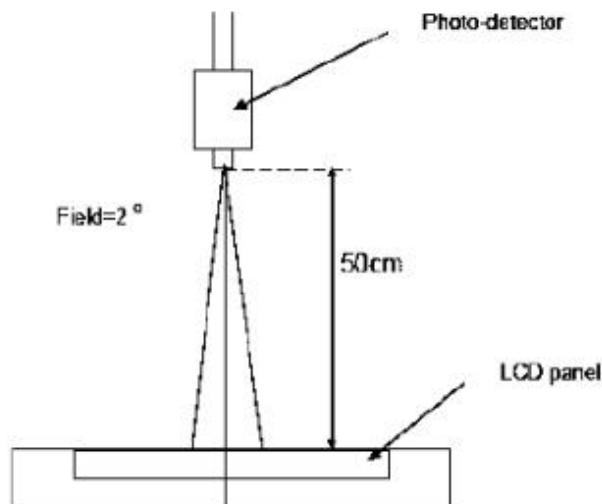
(Ta=25±2°C)

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center point)		C/R	-	-	-	-	-	BM-7 Note(2)
Luminance of white (Center point)		L _w	B/L on	-	TBD	-	cd/m ²	BM-7
Luminance uniformity		U _w	θ = 0. Normal viewing angle B/L On Note(1)	75	-	-	%	BM-7 Note(3)
Response Time		Tr + Tf		-	20	40	ms	BM-5AS Note(4)
Color Chromaticity (CIE 1931)	White	W _x		0.287	0.302	0.317	-	BM-7 Note(5)
		W _y		0.314	0.329	0.344		
	Red	R _x		0.641	0.656	0.671		
		R _y		0.312	0.327	0.342		
	Green	G _x		0.273	0.288	0.303		
		G _y		0.575	0.590	0.605		
	Blue	B _x		0.123	0.138	0.153		
		B _y		0.096	0.111	0.126		
Viewing Angle	Hor.	θ _L	C/R≥10	70	80	-	Deg	EZ Contrast Note(6)
		θ _R		70	80	-		
	Ver.	θ _u		70	80	-		
		θ _D		70	80	-		
		Optima View Direction		ALL Viewing				

* This condition will be changed by the evaluation circumstance. If product is exposed to high temperatures for extended time, there is a possibility of the polarizer film damage which could degrade the optical characteristics.

Notes:

- (1) Test Equipment Setup: After stabilizing and leaving the panel alone at a given temperature for 30min, the measurement should be executed. Measurement should be executed in a stable, windless, and dark room 30min after lighting the back-light. This should be measured in the center of screen.

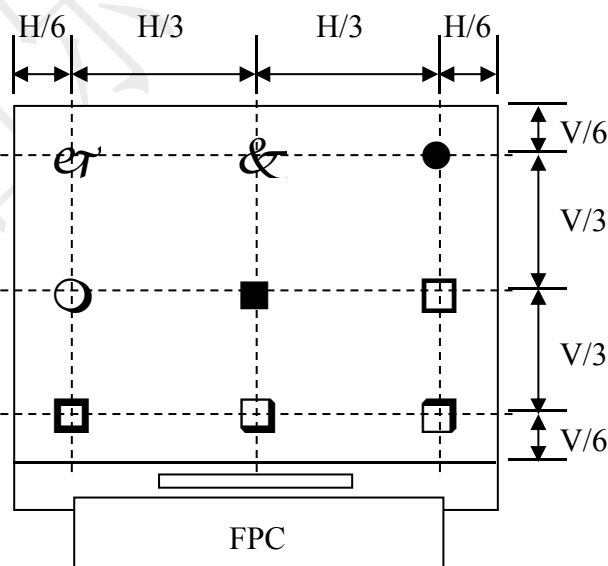


- (2) Definition of Contrast Ratio (CR):

$$\text{Contrast Ratio (CR)} = \frac{\text{Luminance measured when LCD on the "white" state}}{\text{Luminance measured when LCD on the "black" state}}$$

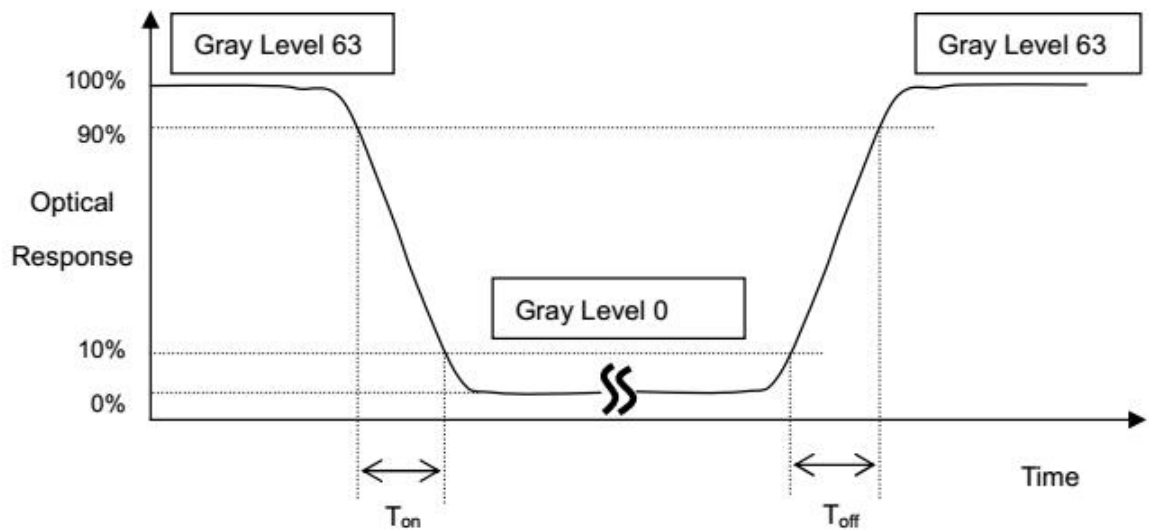
- (3) Definition of Luminance Uniformity: Active area is divided into 9 measuring areas (Shown in below), every measuring point is placed at the center of each measuring area.

$$\text{Luminance Uniformity} = \frac{\text{Min Luminance of white among 9-points}}{\text{Max Luminance of white among 9-points}} \times 100\%$$

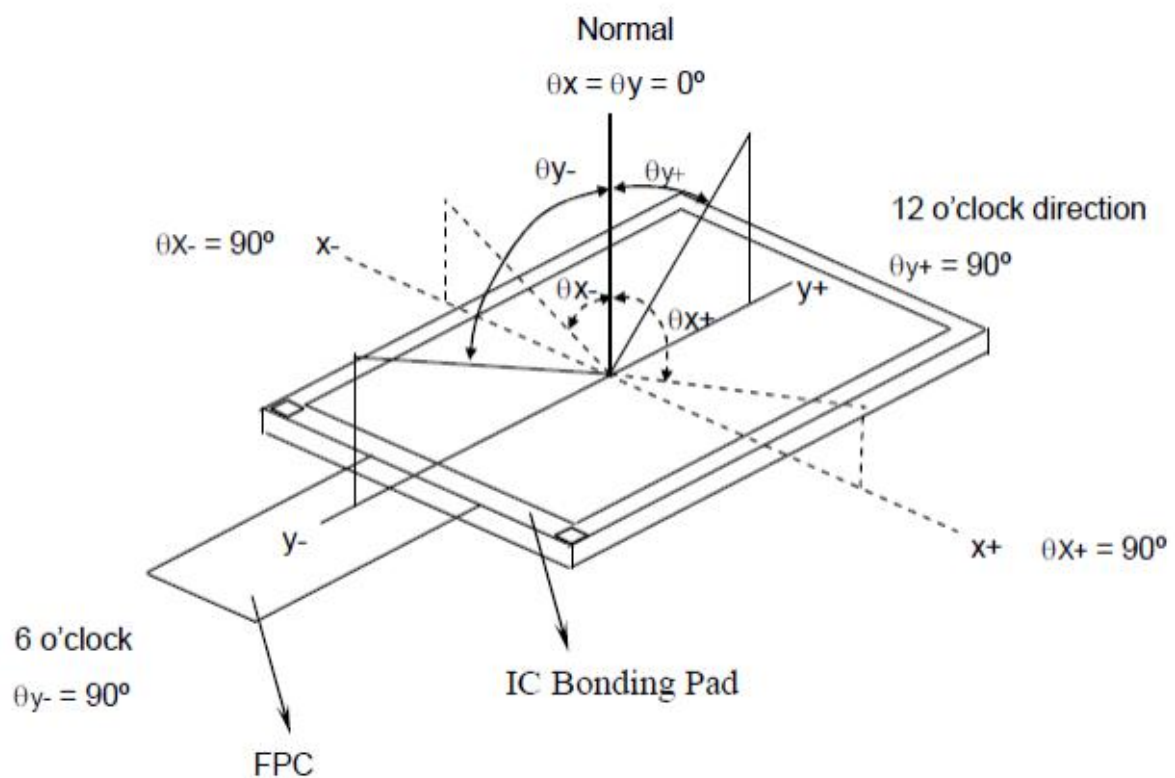


The spot locations for luminance measurement

- (4) Definition of Response time: Sum of Tr and Tf.

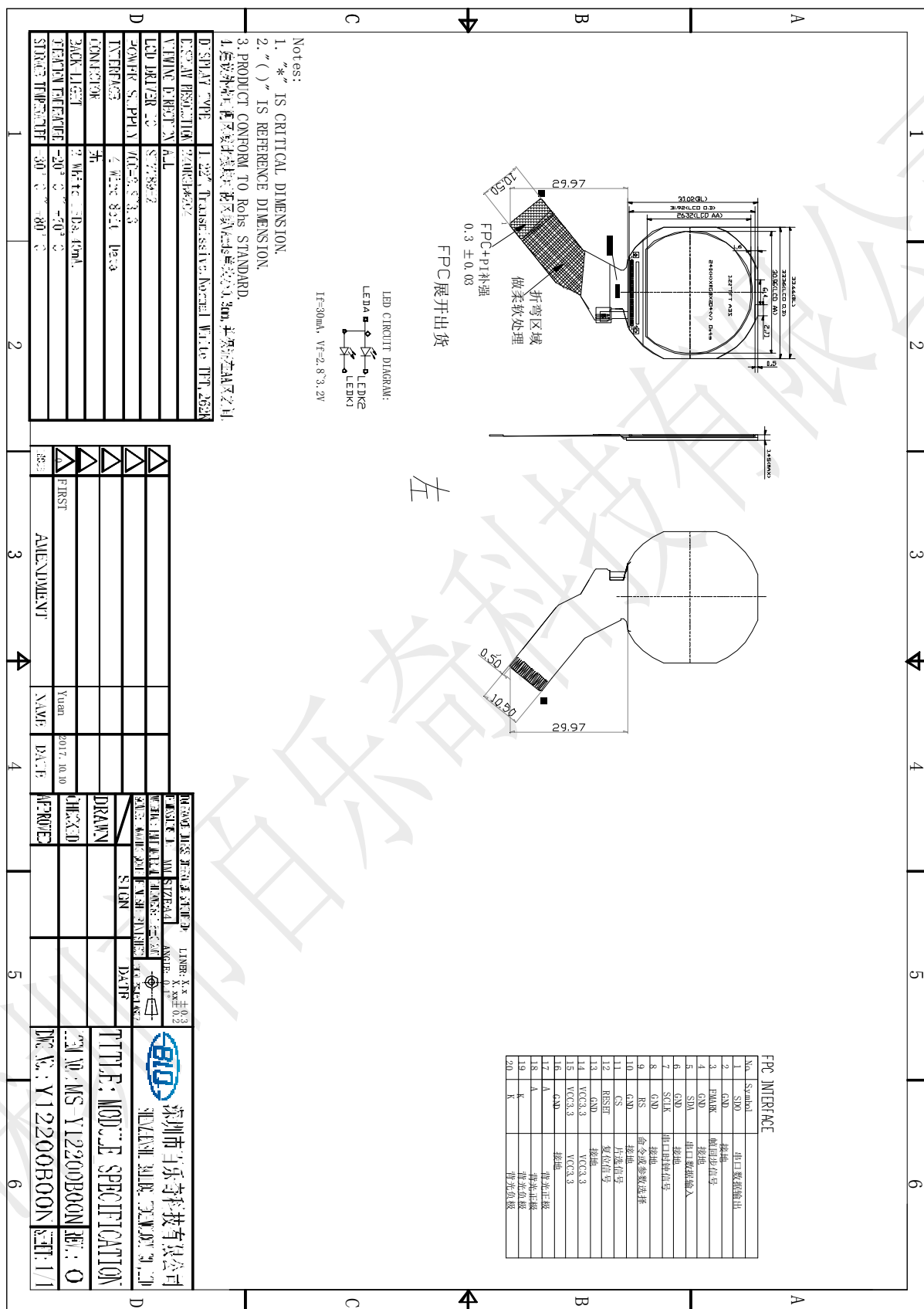


- (5) Definition of Viewing Angle: The viewing angle range that the $CR \geq 10$.



- (6) Definition of Color Chromaticity (CIE 1931)
Color coordinate of white & red, green, blue at center point.
- (7) The different Rubbing Direction will cause the different optima view direction.

5. MODULE OUTLINE DIMENSION





6. MODULE INTERFACE DESCRIPTION

FPC INTERFACE

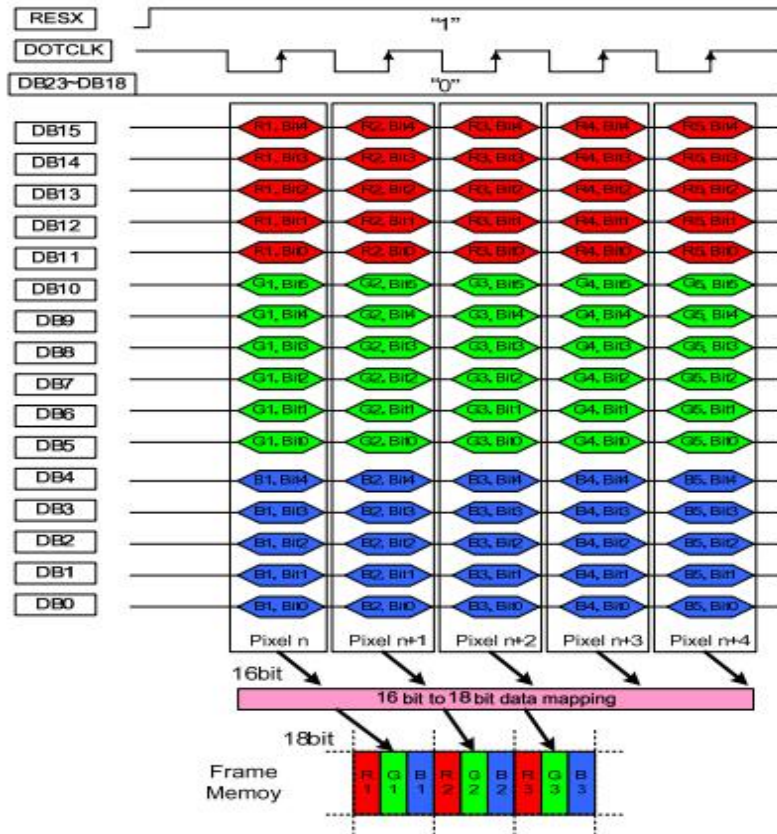
No.	Symbol	
1	SDO	Serial data output
2	GND	ground
3	FMARK	Frame synchronization signal
4	GND	Ground
5	SDA	receive data
6	GND	Ground
7	SCLK	Serial port clock signal
8	GND	Ground
9	RS	Command or parameter selection
10	GND	Ground
11	CS	Chip Select
12	RESET	Reset signal
13	GND	Ground
14	VCC3.3	VCC3.3
15	VCC3.3	VCC3.3
16	GND	Ground
17	A	Backlight positive electrode
18	A	Backlight positive electrode
19	K	Backlight negative electrode
20	K	Backlight negative electrode

7. REFERENCE APPLICATION CIRCUIT

Please consult our technical department for detail information.

8. TIMINGS FOR FOR 8080 MCU Parallels Interface

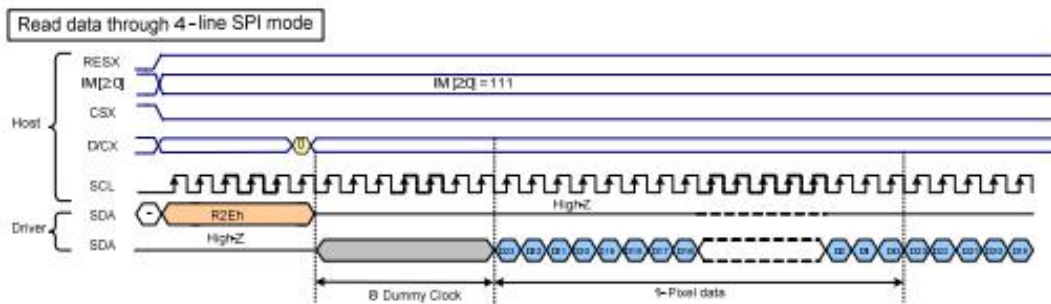
The 16-bit RGB interface is selected by setting the DPI [2:0] bits as 101. The display operation is synchronized with VSYNC, HSYNC and DOTCLK signals. Display data is transferred to the internal GRAM through the 16-bit RGB data bus in synchronization with the display operation.



16-bit/pixel 65K Colors Order on the DPI Interface

Notes:

- The data order is as follows: MSB = DB15, LSB = DB0, and picture data is MSB = Bit 5, LSB = Bit 0 for Green, MSB = Bit 4, LSB = Bit 0 for Red and Blue data.
- 1-time transfer is used to transmit 1 pixel data to the 16-bit color depth information.





4-Line SPI Mode Read Data

9. RELIABILITY TEST CONDITIONS

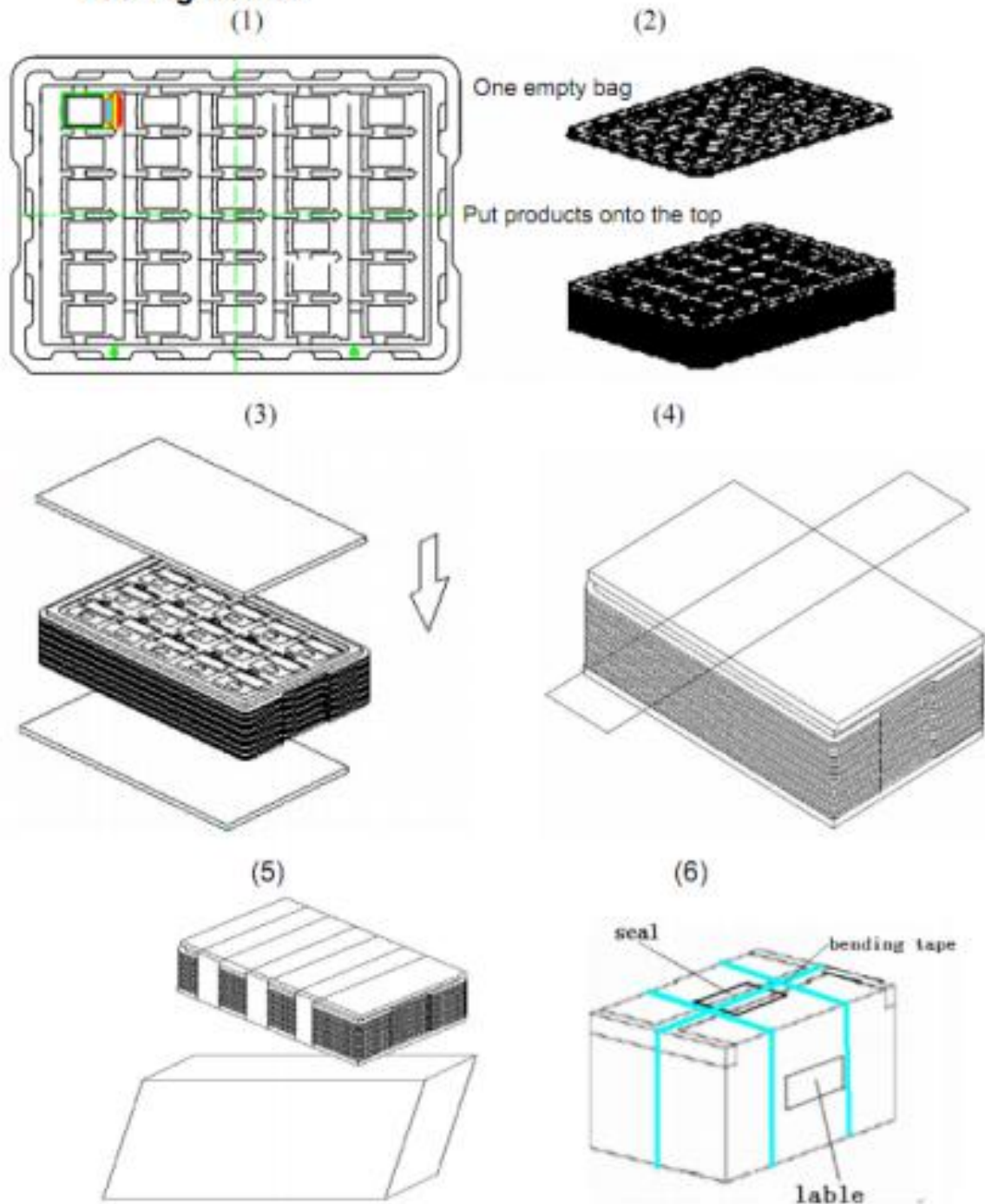
No.	Test Item	Test Condition	Notes
1	High Temperature Storage	+80°C / 240H	Inspection after 2~4h storage at room temperature, the sample shall be free from defects: 1. Air bubble in the LCD; 2. Seal leak; 3. Non-display; 4. Missing segments; 5. Glass crack; 6. The surface shall be free from damage. 7. The electrical characteristics requirements shall be satisfied.
2	Low Temperature Storage	-30°C / 240H	
3	High Temperature Operating	+70°C / 240H	
4	Low Temperature Operating	-20°C / 240H	
5	Temperature Cycle	Ta=-10°C~+25~+50°C, 10 Cycle, per 30min	
6	High Temperature /Humidity storage	60°C, 90%RH /120H	
7	Vibration Test	Frequency: 10Hz~55Hz~10Hz Amplitude: 1.5mm, 2 hours for each direction of X, Y, Z	
8	Packing Drop Test	Drop to the ground from 1m height, 1 corner, 3 edges, 6 surfaces.	
9	ESD test	Voltage: ±8KV R: 330Ω C: 150pF Air discharge, 10time	

Remarks:

- (1) The test samples should be applied to only one test item.
- (2) Sample size for each test item is 5~10pcs.
- (3) For High Temperature/Humidity storage test, pure water (resistance > 10MΩ) should be used.
- (4) In case of malfunction defect caused by ESD damage, if it would be recovered to normal state after resetting, it would be judge as a good part.
- (5) Failure judgment criterion: basic specification, electrical characteristic, mechanical characteristic, optical characteristic.

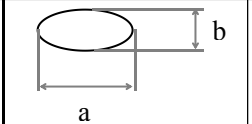
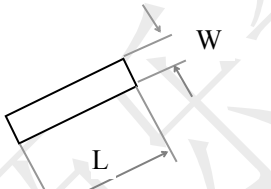
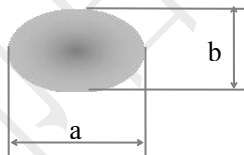
10. PACKING SPECIFICATION

Packing Method

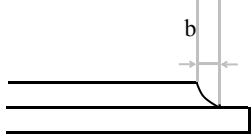
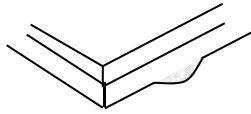


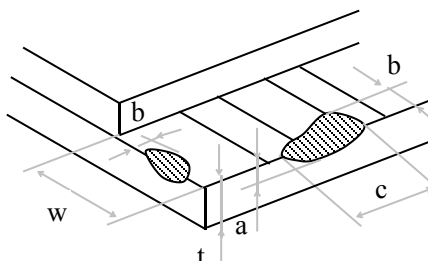
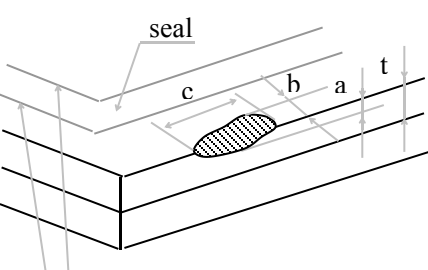
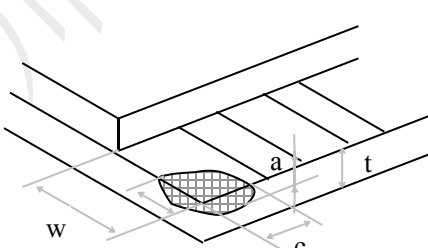
1. Put module into tray cavity:
2. Tray stacking
3. Put 1 cardboard under the tray stack and 1 cardboard above:
4. Fix the cardboard to the tray stack with adhesive tape:
5. Put the tray stack into carton.
6. Carton sealing with adhesive tape.

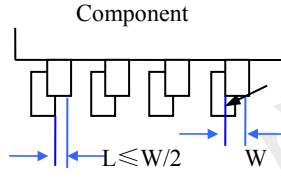
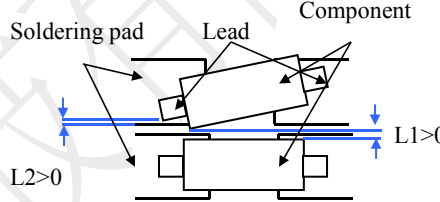
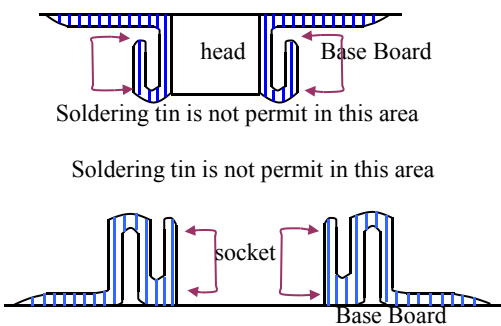
11. INSPECTION CRITERION

Inspection item			Judgement standard			
			Category		Acceptable number	
					A zone	B zone
1	Black spot, White spot, Bright Spot, Pinhole Foreign Particle, Bubble and Particle Between polarizer and glass, scratch on polarizer	 $\Phi=(a+b)/2(\text{mm})$	A	$\Phi \leq 0.10$	Ignored	Ignored
			B	$0.10 < \Phi \leq 0.20$	2	
	C	$\Phi > 0.2$	0			
	Total defective point(B,C)		2			
	Pixel point defect	Bright spot	$0.15 < \Phi \leq 0.20$		$N \leq 0$	Ignored
		Dark spot/ Black spot	$0.15 < \Phi \leq 0.20$		$N \leq 2$	
		Attached to the two pixels are bright spots	$0.15 < \Phi \leq 0.20$		$N \leq 0$	
		Even a two pixel is dark	$0.15 < \Phi \leq 0.20$		$N \leq 0$	
		Pixel total number	$0.15 < \Phi \leq 0.20$		$N \leq 2$	
	Note1: the spot defect caused by foreign matter is judged according to the defect of the foreign body. Note 2: when the light is not wired to show the type of defects.					
2	Black line, White line, Bubble and Particle Between Polarizer and glass, Scratch on polarizer	 W:Width, L:Length(mm)	A	$W \leq 0.03 \quad L \leq 3.0$	Ignored	Ignored
			B	$0.03 < W \leq 0.05 \quad L \leq 3.0$	2	
			C	$0.05 < W$	0	
Total defective point(B,C)		2				
3	Contrast variation	 $\Phi=(a+b)/2(\text{mm})$	A	$\Phi \leq 0.1$	Ignored	Ignored
			B	$0.1 < \Phi \leq 0.3$	2	
			C	$\Phi > 0.3$	0	
Total defective point(B,C)		2				
4	Bubble inside cell		any size		none	none
5	Polarizer defect (if Polarizer is used)	Scratch and damage on polarizer, particle on polarizer or between polarizer and glass.	Refer to item 1 and item 2.			
		Bubble, dent and convex	A	$\Phi \leq 0.3$	Ignored	Ignored
			B	$0.3 < \Phi \leq 0.5$	2	
			C	$0.5 < \Phi$	0	
Total defective point(B,C)		2				



Inspection item		Judgement standard	
		Category	Acceptable number
			A zone B zone
6	Surplus glass	①Stage surplus glass 	$b \leq 0.3\text{mm}$
		②Surrounding surplus glass 	Should not influence outline dimension and assembling.
7	MURA	①MURA	Naked eye examination: red, green, blue screen does not allow the appearance, black screen requires visual is not obvious, the specific reference limit samples. Note: the principle of closing the sample is to be installed on the whole machine and the end user will not find it in the normal usage scenario. Inspection basis: 6%ND (MURA mainly in the black screen and indoor light is relatively dark will be found, it is recommended to turn off the indoor lighting inspection.)
		②Point Black / White / point(MURA) 	1, under the black / gray screen check: $D \leq 0.10\text{mm}$ Ignored; $0.10\text{mm} < D \leq 0.3\text{mm}$, $N \leq 2$; $D > 0.3\text{mm}$: Unqualified. 2, switch to the red, green, blue in which any one of the screen appears black or white or point to point white or point of failure. 

Inspection item		Judgment standard		
		Category(application: B zone)		
8	Glass defect crack	①The front of lead terminals	A	If $a \leq t$ and $b \leq 1.0$, c is not limited
			B	$a \leq t$, $1 \leq b \leq 2\text{mm}$, $c \leq 3\text{mm}$
			C	If glass crack cover alignment mark, $b \leq 0.5\text{mm}$.
			D	Crack at two sides of lead terminals should not cover patterns and alignment mark
		②Surrounding crack—non-contact side	 <u>Inner border line of the seal</u> <u>Outer border line of the seal</u> $b < \text{Inner borderline of the seal}$	
③ Surrounding crack— contact side	$b < \text{Outer borderline of the seal}$			
		④Corner	A	$a \leq t$, $b \leq 3.0$, $c \leq 3.0$
		*Glass crack should not cover patterns used for		
				

Inspection item			Judgement standard
9	FPC defect	Component soldering: No cold soldering, short/open circuit, burr, tin ball. The flat encapsulation component position deviation must be less than 1/2 width of the pin (Pic.1); The sheet component deviation: pin deviates from the pad and contact with the near components is not permitted (Pic.2)	
		lead defect: The lead lack must be less than 1/2 of its width; The lead burr must be less than 1/2 of the seam; Impurities connect with the near leads is not permitted	
		Connector soldering: Soldering tin is at contact position of the plug and socket is not permitted No foundation is scald Serious cave distortion on plug and socket contact pin is not permitted	

12. GENERAL PRECAUTIONS



1.1 HANDING

- (1) When the module is assembled, it should be attached to the system firmly. Be careful not to twist and bent the module.
- (2) Refrain from strong mechanical shock and / or any force to the module. In addition to damage, this may cause improper operation or damage to the module and back-light unit.
- (3) Note that display modules are very fragile and could be easily damaged. Do not press or scratch the surface harder than a HB pencil lead.
- (4) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, straining and discoloration may occur.
- (5) If the display module surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, should be wiped by moisten cloth with isopropyl alcohol or ethyl alcohol solvents, DO NOT with water, ketone type materials (e.g. acetone), aromatic, toluene, ethyl acid or methyl chloride, and so on.
- (6) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, legs or clothes, it must be washed away thoroughly with soap.
- (7) Use finger-stalls with sort gloves in order to keep display clean during the incoming inspection and assembly process.
- (8) Protection film for polarizer on the module shall be slowly peeled off just before use so that the electrostatic charge can be minimized.
- (9) Do not touch directly conductive parts such as the CMOS LSI pad and the interface terminals with bare hands, therefore operations should be grounded whenever he/she comes into contact with the modules.
- (10) Do not exceed the absolute maximum rating value. (The supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on), otherwise the module may be damaged.

1.2 SOLDERING

- (1) Use soldering irons with proper grounding and no leakage.
- (2) For No RoHS Product: soldering temperature is 290~350°C, soldering time is 3~5s; for RoHS Product: soldering temperature is 340~370°C, soldering time is 3~5s.
- (3) If soldering flux is used, be sure to remove any remaining flux after soldering (This does not apply in the case of a non-halogen type of flux).

1.3 STORAGE

- (1) DO NOT leave the module in high temperature and high humidity for a long times, keep the temperature from 0°C to 35°C and relative humidity of less than 60%.
- (2) It is highly recommended to store the module in a dark place. The Liquid crystal is deteriorated by ultraviolet, DO NOT leave it in direct sunlight and strong ultraviolet ray for many hours.
- (3) The polarizer surface should not come in contact with any other objects.