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BYD LCM

PRODUCT SPECIFICATIONS

RoHS

MODULE NO.: BM320240-4281FTGF

For Customer: ____________________

Approved by: ____________________

Signature: ____________________

Date: ____________________

Please sign the cover page of the spec for your approval and return it to our local sales **within a month** after your receipt of the spec from Byd. In the case Byd does not receive the signed spec even after one month later, in general we will consider that the spec was already accepted by your company.

Prepared	Checked	Approved	Date
Zhu Weili	Yu Xiang	Wang Huazu	2009-4-15

History of Versions and Modifications

Version	Modifications	Date
A	Generation first version	2007-10-7
B	Update Recommand Initial Code	2007-10-30
C	Update Recommand Initial Code	2007-11-14
D	Update LCM	2008-5-7
E	Update initial code and interface PIN connections	2008-5-15
F	Add electro-optical characteristics	2008-11-24
G	Update Recommand Initial Code	2009-4-15

PRODUCT SPECIFICATIONS

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MODULE CLASSIFICATION INFORMATION

BM320240-4281FTGF

B: BYD Company Limited

M: M: LCD Module P: LCD Panel

320240:Display Capacity

4281: Serial Number

F: LCM

T: TN
G: STN Gray
E: ECB LCD
H: HTN
D: DSTN
M: MLCD
Y: STN Yellow green
W: FSTN
F: TFT LCD
B: STN Blue
C: Color STN
O: OLED

T:Display Mode

T:Transmissive
R:Reflective
F:Transflective
C:Oled Color
M:Oled Mono

G:Connection Type or module Circuit Technique

P:Pin connection
B:COB
O:Others
H:Heat seal
T:TAB
C:FPC
G:COG
Z:Zebra
F:COF

F: Product Version: From A to Z

◆ LCD MODULE PHYSICAL DATA

- **General Description**

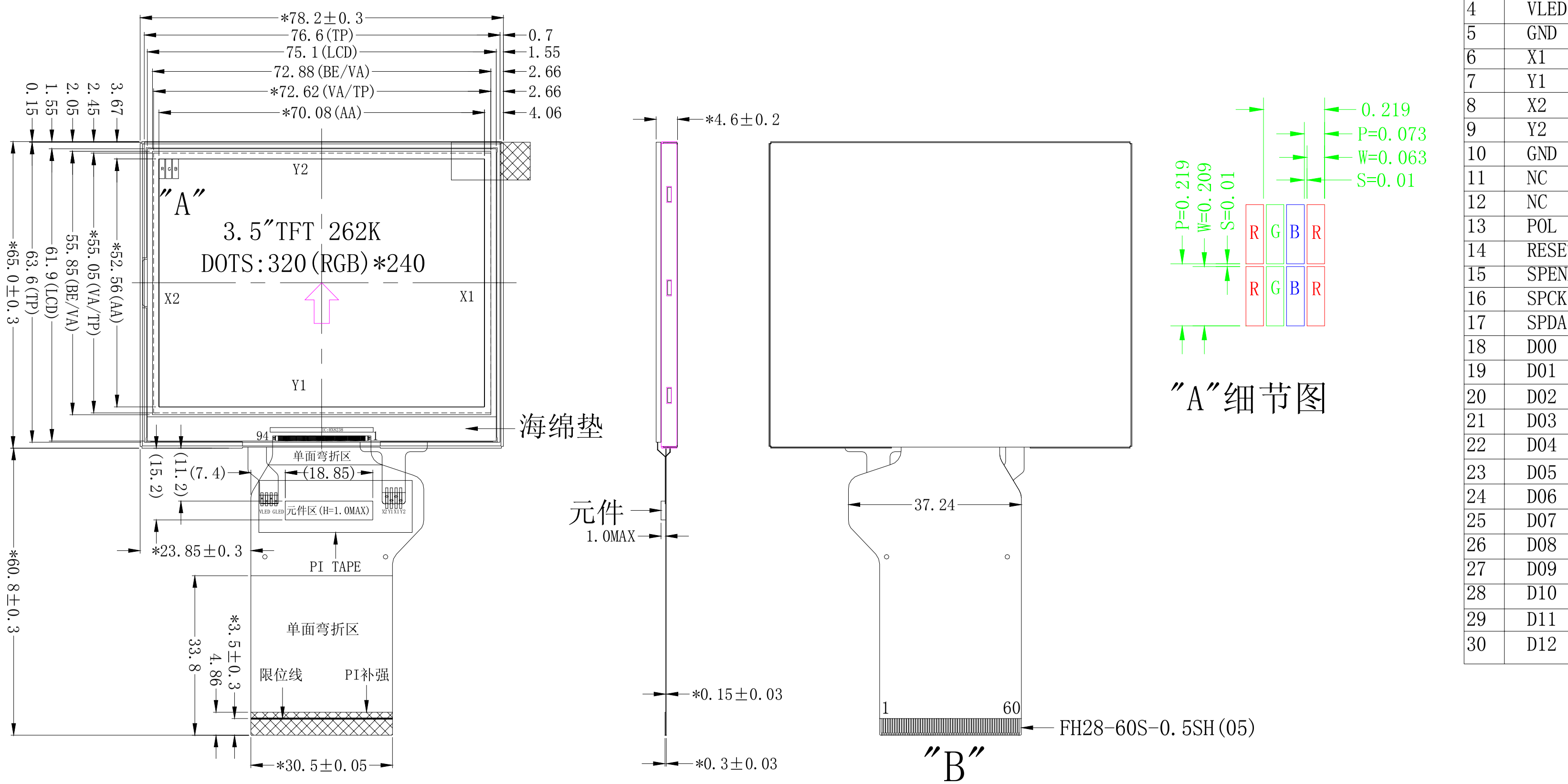
Display Type	**262K TFT**
Display Mode	**POSITIVE**
Viewing Direction	**6 o'clock**
Connection Type	**COG**
Operation temperature	**-20℃ ~70℃**
Storage temperature	**-30℃ ~80℃**
Driving IC	**HX8238**

- **Mechanical Description**

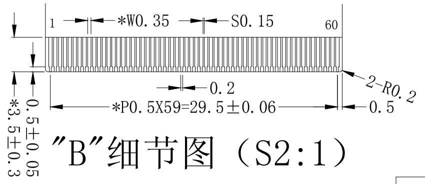
Item	Standard Value	Unit
Number of dots	**320RGB X240 dots**	-
LCM dimension	**78.2 (W) X65 (H) X4.6(T)**	**mm**
TP outline	**76.6 (W) X63.6(H))**	**mm**
LCD outline	**75.1 (W) X61.9 (H) X1.50 (T)**	**mm**
Active area	**70.08(W) X 52.56(H)**	**mm**
Dot size	**0.063 (W) X0.209 (H)**	**mm**
Dot pitch	**0.073 (W) X0.219(H)**	**mm**
Backlight	**6-CHIP LEDS serial**	/
The KEY and accessory materials of our product according with BHS-001 standard		

◆ EXTERNAL DIMENSIONS

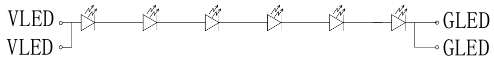
CUSTOMER'S MODEL NO.:	CUSTOMER APPROVED:	DATE:


*78.2±0.3
76.6(TP)
75.1(LCD)
72.88(BE/VA)
*72.62(VA/TP)
*70.08(AA)
0.7
1.55
2.66
2.66
4.06
3.67
2.45
2.05
1.55
0.15
*52.56(AA)
*55.05(VA/TP)
55.85(BE/VA)
61.9(LCD)
63.6(TP)
*65.0±0.3
*60.8±0.3
"A"
3.5"TFT 262K
DOTS:320(RGB)*240
Y2
X2
X1
Y1
94
海绵垫
单面弯折区
(18.85)
(7.4)
(11.2)
(15.2)
元件区(H=1.0MAX)
*23.85±0.3
PI TAPE
单面弯折区
限位线
PI补强
*3.5±0.3
4.86
33.8
*30.5±0.05
*4.6±0.2
元件
1.0MAX
*0.15±0.03
*0.3±0.03
37.24
1
60
FH28-60S-0.5SH(05)
"B"
0.219
P=0.073
W=0.063
S=0.01
P=0.219
W=0.209
S=0.01
R G B R
R G B R
"A"细节图

出货图


1
*W0.35
S0.15
60
0.2
*P0.5X59=29.5±0.06
2-R0.2
0.5
0.5±0.05
*3.5±0.3

"B"细节图（S2:1）


VLED
VLED
GLED
GLED

背光电路图

1	GLED	31	D13
2	GLED	32	D14
3	VLED	33	D15
4	VLED	34	D16
5	GND	35	D17
6	X1	36	D18
7	Y1	37	D19
8	X2	38	D20
9	Y2	39	D21
10	GND	40	D22
11	NC	41	D23
12	NC	42	IHS
13	POL	43	IVS
14	RESET	44	CLK
15	SPENA	45	NC
16	SPCK	46	NC
17	SPDA	47	VCC
18	D00	48	VCC
19	D01	49	NC
20	D02	50	NC
21	D03	51	NC
22	D04	52	NC
23	D05	53	NC
24	D06	54	NC
25	D07	55	NC
26	D08	56	NC
27	D09	57	SHUT
28	D10	58	DEN
29	D11	59	GND
30	D12	60	GND

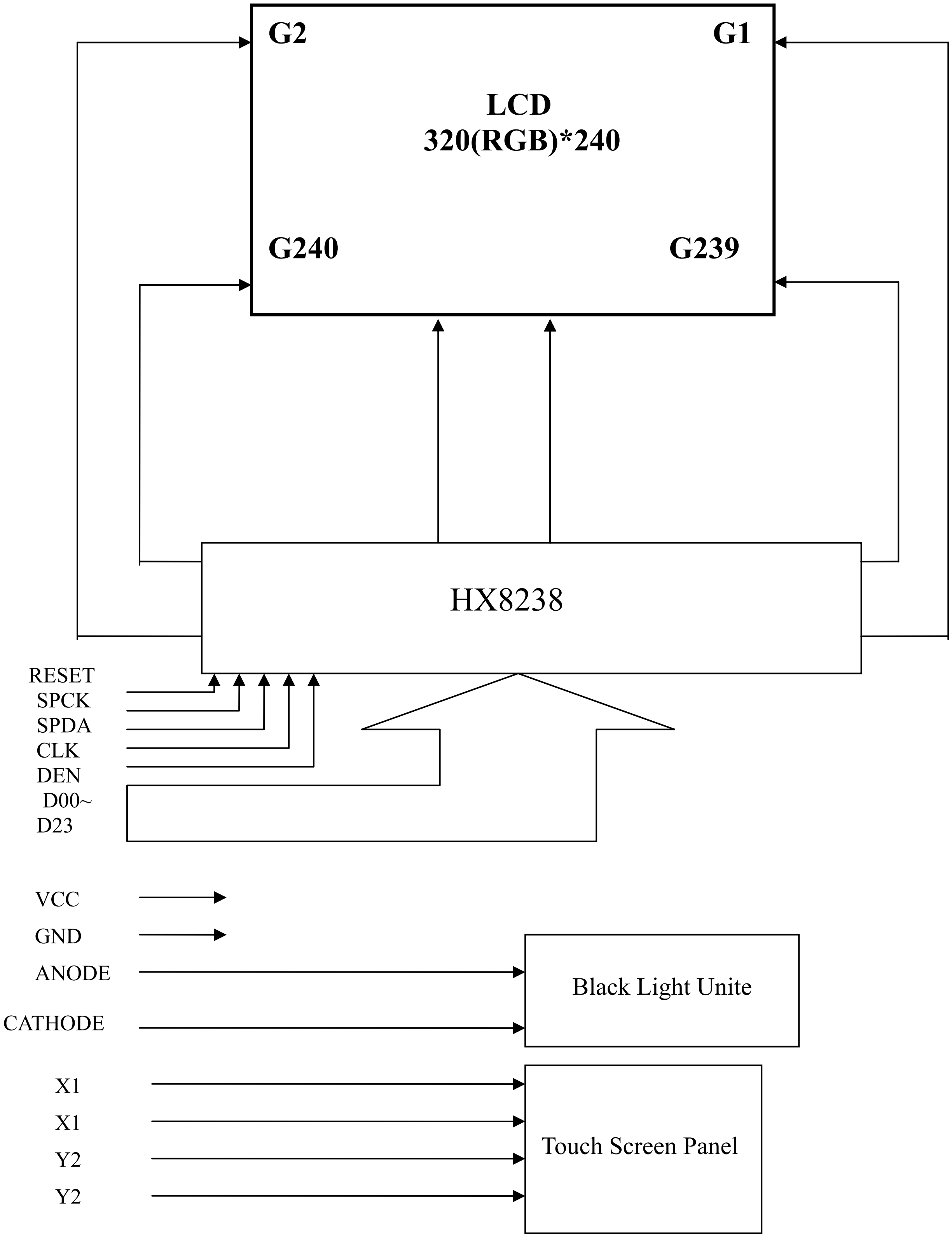
要求：

1. 显示方式：3.5″TFT,262K
2. 驱动IC:HX8238(COG)
3. 偏光片：光面宽视角，全透/正性
4. 背光灯源：6颗白色LED灯串联,冷色调
   工作电流：20mA/CHIP
5. 模组表面亮度：200cd/m2 MIN
6. 工作温度：-20° C～70° C
7. 存储温度：-30° C～80° C
8. 未注公差：±0.2
9. 标*号为重要尺寸，标△为修改记录
10. 机壳开窗比AA区单边外扩不超过0.6
    垫圈比VA/TP单边外扩0.7以上
11. 产品符合BHS-001标准

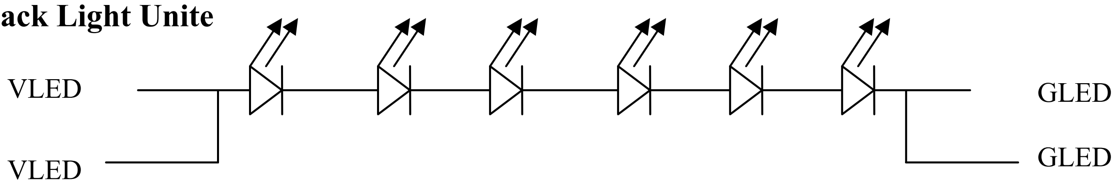
REVISION RECORD		DATE	BYD COMPANY LIMITED				
1			TITLE: LCM OUTLINE DIMENSION				D/N : BM4281F
2			FILE NAME :4281F模组图		Rev. :	2	P/N :
3			FILE NO. : LCD-DR-001802		Ver. :	A	SCALE : N.T.S.
4			DRAWN BY		DATE		UNIT : mm
5			CHECKED BY		DATE		PRO.(3): ⊕◁
6			APPROVED BY		DATE		SHEET : 1/1

◆ BLOCK DIAGRAM

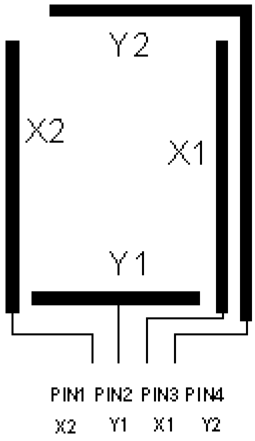
- **TFT-LCD Module (Interface System Structure)**


G2
G1
LCD
320(RGB)*240
G240
G239
HX8238
RESET
SPCK
SPDA
CLK
DEN
D00~
D23
VCC
GND
ANODE
CATHODE
Black Light Unite
X1
X1
Y2
Y2
Touch Screen Panel

- **Black Light Unite**



- **Touch Screen Panel(Top View)**



◆ ABSOLUTE MAXIMUM RATINGS

Item	Symbol	Rating	Unit
Operating temperature	Top	-20 to 70	℃
Storage temperature	Tst	-30 to 80	℃
Input voltage	VCI	VSS - 0.3 to 5.0	V
Supply voltage	VDD	-0.3 to +4.0	V
Supply voltage for LCD	VGH – VSSA	15.6	V

NOTE:

1. **If the module is used above these absolute maximum ratings. It may become permanently damaged. Using the module within the following electrical characteristic conditions are also exceeded, the module will malfunction and cause poor reliability.**
2. **VDD>GND must be maintained.**

◆ ELECTRICAL CHARACTERISTICS

● DC Characteristics

Vss= 0V, Ta= 25℃

Item	Symbol	Condition	Min	Typ	Max	Unit
Power supply	VDD	Ta=25℃	1.4	3.3	3.6	V
LCD driving voltage	VGH	Ta=25℃	-	15.6	-	V
Current consumption for LCD normal operation	IDD	VDD=3.3V	-	10.1	-	mA

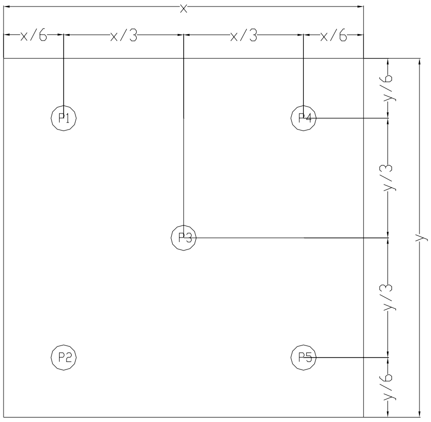
● Back-Light unit

Item	Symbol	Min	Typ	Max	Unit	Remark
Current	I_{BL}	-	20	-	mA	1 LED
CIE	X	0.25	-	0.29	-	X>Y
	Y	0.24	-	0.28	-	
Brightness	-	3800	-	-	cd/m²	-
Luminance Uniformity Ratio	-	80	-	-	%	-
Bezel(BE) must be connected to ground of the main board						

Note:

1. Average Luminous Uniformity of P1 ~ P5（Using a luminance meter BM-7）
2. Luminous Uniformity Ratio = min/max * 100%

Measured Method (X*Y: Light Area).



● AC Characteristics

Refer to the SPEC of **HX8238**

◆ Touch Screen Panel Specifications

1.Electrical Characteristics

Item	Min	Typ	Max	Unit	Note
Linearity	-	-	1.5	%	X-Axis,Y-Axis
Terminal Resistance	200	-	900	Ω	X(Glass side)
	200	-	900	Ω	Y(Film side)
Insulation Resistance	25	-	-	MΩ	DC 25V
Operating voltage	-	-	7	V	DC
Response Tine	-	-	10	Ms	-
Transmittance	73	-	-	%	-

Note 1) : Do not operate it with a thing except a polyacetal pen(tip R0.8mm or less) or a finger, especially those with hard or sharp tips such as a ball point pen or a mechanical pencil

2. Mechanical & Durability Characteristics

Item	Min	Typ	Max	Unit	Note
Operating Force	-	-	100	G	(1)
Touch Test	1，000,000	-	-	Times	(2)
Handwriting Friction Test	100,000	-	-	Times	(3)
Surface hardness	3	-	-	H	(4)

Note (1) Pen : 0.8N or less (R0.8mm)
Finger : 0.8N or less (0.8mm)
(2) Measusuement for Center part of Panel
-Hitting Pad : Tip R8mm Silicon Rubber & Tip R0.8mm Stylus pen
-Lode :150gf
-Speed :2times/sec
-Electric lode :None
(3) Measuremenf for 2.0mm inside of transparent insulation
-Sliding Pen : Tip R0.8mm Stylus pen
-Lode :150gf
-Speed :60mm/sec
-Sliding Length :25mm
-Electric lode : None
(4) Pressure 500gf , 45deg

3. Integration Design Guide

- Avoid the design that Front-case overlap and press on the active area of the touch-panel.
- Give enough gap (over 0.5mm at compressed) between the front case and touch-panel to protect wrong operating.
- Use a buffer material(Gasket) between the touch-panel and Front-case to protect damage and wrong operating.
- Avoid the design that buffer material overlap and press on the inside of touch-panel viewing area.

◆ INTERFACE PIN CONNECTIONS

NO.	Symbol	Description	Input/Output	Note
1	GLED	Backlight pin	Input	-
2	GLED		Input	-
3	VLED		Input	-
4	VLED		Input	-
5	GND	Ground	Input	-
6	X1	TP pin	Input	-
7	Y1		Input	-
8	X2		Input	-
9	Y2		Input	-
10	GND	Ground	Input	-
11	NC	No connection	-	-
12	NC			
13	POL	Vcom Generate Signal	Output	-
14	RESET	System Reset	Input	-
15	SPENA	Serial port data enable signal	Input	-
16	SPCK	Serial port clock	Input	-
17	SPDI	Serial data input	Input	-
18	D00	Blue Data (LSB)	Input	-
19	D01	Blue Data	Input	-
20	D02	Blue Data	Input	-
21	D03	Blue Data	Input	-
22	D04	Blue Data	Input	-
23	D05	Blue Data	Input	-
24	D06	Blue Data	Input	-
25	D07	Blue Data (MSB)	Input	-
26	D08	Green Data(LSB)	Input	-
27	D09	Green Data	Input	-
28	D10	Green Data	Input	-
29	D11	Green Data	Input	-
30	D12	Green Data	Input	-
31	D13	Green Data	Input	-
32	D14	Green Data	Input	-
33	D15	Green Data(MSB)	Input	-
34	D16	Red Data(LSB)	Input	-
35	D17	Red Data	Input	-
36	D18	Red Data	Input	-
37	D19	Red Data	Input	-
38	D20	Red Data	Input	-

39	D21	Red Data	Input	-
40	D22	Red Data	Input	-
41	D23	Red Data(MSB)	Input	-
42	IHS	Horizon sync signal	Input	-
43	IVS	Vertical sync signal	Input	-
44	CLK	System clock input	Input	-
45	NC	No connection	-	-
46	NC		-	-
47	VCC	Power supply	Input	-
48	VCC		Input	-
49	NC	No connection	-	-
50	NC			
51	NC			
52	NC			
53	NC			
54	NC			
55	NC			
56	NC			
57	SHUT	Display shut down pin to put the driver into sleep mode. Internal pull low. - Connect to VDDIO for sleep mode - Connect to VSS for normal operating mode	Input	-
58	DEN	Display enable pin from controller	Input	-
59	GND	Ground	Input	-
60	GND		Input	-

◆ RECOMMAND INITIAL CODE

```
void WriteRegHX8238(unsigned int reg)
{
	int i,tmp;

	CS(0);
	tmp=0x70;//01110000//RS=0,RW=0
	for(i=7;i>=0;i--)
	{
		SCL(0);
		SDI((tmp>>i)&0x01);
		SCL(1);
	}
	for(i=15;i>=0;i--)
	{
		SCL(0);
		SDI((reg>>i)&0x01);
		SCL(1);
	}
	CS(1);

}
void WriteDatHX8238(unsigned int dat)
{
	int i,tmp;
	CS(0);
	tmp=0x72;//01110010//RS=1,RW=0
	for(i=7;i>=0;i--)
	{
		SCL(0);
		SDI((tmp>>i)&0x01);
		SCL(1);
	}
	for(i=15;i>=0;i--)
	{
		SCL(0);
		SDI((dat>>i)&0x01);
		SCL(1);
	}
	CS(1);
}

void ResetHX8238()
{
	RESET(0);
	Delayms(20);//must more than 20ms
	RESET(1);
	Delayms(20);//must more than 20ms
}

void InitHX8238()
{
        ResetHX8238();

        WriteRegHX8238(0x0001);//Driver Output Control
        WriteDatHX8238(0x6300);//

        WriteRegHX8238(0x0002);//LCD-Driving-Waveform Control
        WriteDatHX8238(0x0200);//B/C=1,NW7-0=0

        WriteRegHX8238(0x0003);//Power control 1
        WriteDatHX8238(0x7166);//0x7664 0xa164

        WriteRegHX8238(0x0004);//Input Data and Color Filter Control
        WriteDatHX8238(0x0447);//SWD2-0=111,SEL2-0=000,

        WriteRegHX8238(0x0005);//Function Control
        WriteDatHX8238(0xBCD4);//0xbcd4 0xfcd4 0xb4d4

        WriteRegHX8238(0x000A);//Contrast/Brightness Control
        WriteDatHX8238(0x3F08);//0x4008

        WriteRegHX8238(0x000B);//Frame Cycle Control
        WriteDatHX8238(0xD400);//0xd400 0xc400 0xc470

        WriteRegHX8238(0x000D);//Power Control 2
        WriteDatHX8238(0x123A);//VLCD63,0x123a 0x123f

        WriteRegHX8238(0x000E);//Power control 3
        WriteDatHX8238(0x3100);//VCOMA,0x2c00 0x3500 0x3000

        WriteRegHX8238(0x000F);//Gate Scan Position
        WriteDatHX8238(0x0000);

        WriteRegHX8238(0x0016);//Horizontal Porch
        WriteDatHX8238(0x9F86);

        WriteRegHX8238(0x0017);//Vertical Porch
        WriteDatHX8238(0x2212);

        WriteRegHX8238(0x001E);//Power control 4
        WriteDatHX8238(0x00E1);//VCOMH,0x00cb 0x00f2 0x00e0
}
```

◆ ELECTRO-OPTICAL CHARACTERISTICS

Driving condition: VDD=2.8V, I_{BL}=20mA/LED, Temperature =23℃±5℃，Humidity=60%±20%RH

Item			Light angle（°）	Temp（°C）	Symbol	Specifications			Unit	Conditions	Note
						Min.	Typ.	Max.			
Transmissive			0	25	-	-	7.5	-	%	(Equipment :BM-7/CS-200)	(1)
Contrast ratio			0	25	Cr	150	250	-	-		(2)
Brightness			0	25	-	-	-	-	-		-
Luminance uniformity (surface within panel)			0	25	Lu	70	80	-	%		(3)
Cross talk			0	25	CTV	-	-	20	%		(4)
Chromaticity	R x		0	25	Rx	0.590	0.640	0.690	-		-
	R y				Ry	0.294	0.344	0.394			
	G x				Gx	0.248	0.298	0.348			
	G y				Gy	0.533	0.583	0.633			
	B x				Bx	0.082	0.132	0.182			
	B y				By	0.087	0.137	0.187			
	W x				Wx	0.322	0.372	0.422			
	W y				Wy	0.299	0.349	0.399			
Color Reproduction Area(NTSC)			0	25	-	-	60	-	%	CIE1931(x,y)	(5)
Response time	Tr		0	25	-	-	15	20	ms	Viewing normal angle $\theta_X = \theta_Y = 0^0$	-
	Tf					-	35	50			
Viewing angle	Hor.	θ_{X+}	0	25	-	-	60	-	deg	Center CR≥10	-
		θ_{X-}			-	-	60	-			
	Ver.	θ_{Y+}			-	-	65	-			
		θ_{Y-}			-	-	45	-			

Note:

(1). Transmittance

Introduction

Transmittance (diffuse transmission factor) is a measure for the LCD panel transparency. The Light Source for this measurement is the accompanying LCD-module backlight system (LEDs, Lightguide…)

Measurement conditions:

Measuring Equipment	BM-7/CS-200
Measurement Point Diameter	3mm
Measurement Point Location	Active Area Center Point
Light source	LCD module backlight
Reflectance Plate	Reflectance Standard(cal. plate)
Test pattern	All pixels white
Contrast setting	Maximum

Measuring procedure:
Transmittance:

The light source is located at the backside of the panel.

1、 Measure the light source

2、 Place the LCD panel in front of the light source. Measure the luminance on the LCD panel surface

Definitions

$$\tau = \frac{Lv_{LCD-panel}}{Lv_{lightsource}} * 100\%$$

(2) Definition of Contrast Ratio (C/R): Ratio of gray max (Gmax) & gray min (Gmin) at the center point.

$$CR = \frac{G(Max)}{G(Min)}$$

Where
Gmax: Luminance with all pixels white
Gmin: Luminance with all pixels black

(3). Surface luminance uniformity within panel

Measurement conditions:

Measuring Equipment	CS200 // BM-7
Measurement Point Diameter	3mm // 1mm
Measurement Point Location	Active Area
Light Source	Transmissive Mode: Internal (Backlight)
Test pattern	White

Measuring procedure:

Measure the luminance Li with the points in figure 1.

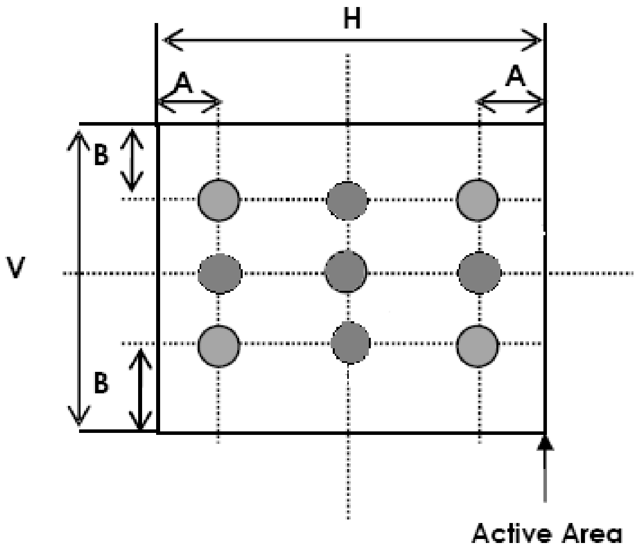


Figure 1

A: 5 mm B: 5 mm
H, V: Active Area

Uniformity value (Lu):

$$Lu = \frac{\max(Li) - \min(Li)}{\max(Li)}$$

(4). CROSS-TALK

Introduction:

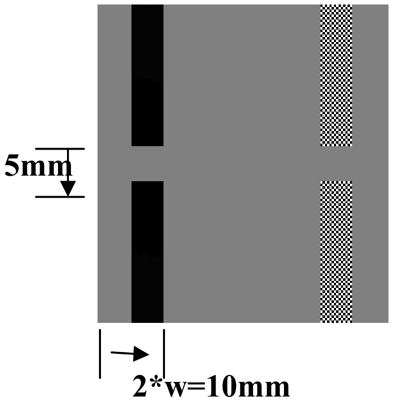
Crosstalk is an effect where the contrast of a display pixel is influenced by the state of the related pixels. A measure for this effect is the Cross Talk Value (CTV)

Measurement conditions:

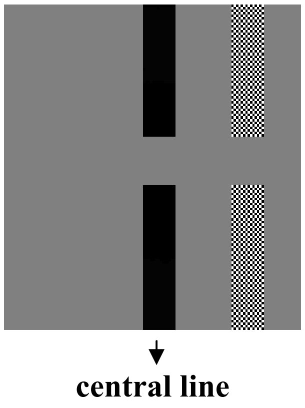
Measuring Equipment	**CS200 // BM-7**
Measurement Point Diameter	**3mm // 1mm**
Measurement Point Location	
Light Source	**Transmissive Mode: Internal (Backlight)**
Contrast setting	**Maximum**

- **Test Pattern (valid for all greyscales):**

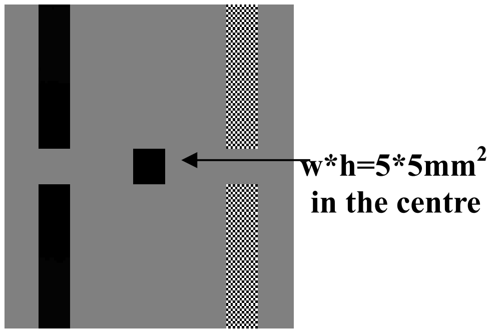
W: The width of the rectangle in the following pictures;



Pattern A



Pattern B



Pattern C

- **Definitions:**

Cross Talk Value:

CTV = |LvA - LvB| / LvA * 100%

Where:

LvA: Luminance measured with the centre test point of pattern A

LvB: Luminance measured with the centre test point of pattern B.

- **Measuring procedure:**

Adaptation of the display to the highest contrast ratio (CR = LvA/LvC) as defined by the test patterns and a test area of 14 x 14 dots.

Measurement of Luminance with test point A, B.

Determination of Crosstalk value (CTV)

(5). NTSC

Measurement conditions:

Measuring Equipment	LCD-5200
Measuring Point Diameter	3mm//1mm
Measuring point location	Active Area center point
Light source	Transmissive Mode: internal(Backlight)
Test pattern	All Pixels White Red.Green.Blue.White: Maximum colour saturation (maximum gradation level)
Contrast setting	Maximum

Definitions
Panel colour coordinates according the CIE colour system (CIE 1931). In general,
It is always requested to measure the X, Y and Z values.
Here u´, v´ and L* are according CIE 1931:

$$x' = \frac{4 \cdot X}{X + 15 \cdot Y + 3 \cdot Z}$$

$$y' = \frac{9 \cdot Y}{X + 15 \cdot Y + 3 \cdot Z}$$

$$L^* = 116 \cdot \left(\frac{Y}{Y_n} \right)^{1/3} - 16$$

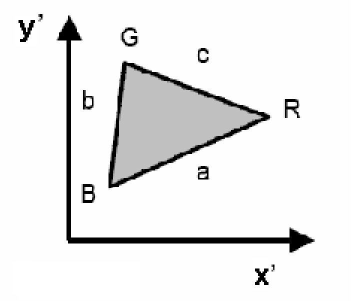
Colour distance definition (maximum allowed colour distance to specified typical colour coordinate):

$$\Delta x' y' = \sqrt{\Delta x'^2 + \Delta y'^2}$$

Where:

$$\Delta x' = Max\left\{ \left| x'_{typ} - x'_{\max} \right|, \left| x'_{typ} - x'_{\min} \right| \right\}$$

$$\Delta y' = Max\left\{ \left| y'_{typ} - y'_{\max} \right|, \left| y'_{typ} - y'_{\min} \right| \right\}$$



Color Gamut definition:

$$F = \sqrt{s(s-a)(s-b)(s-c)} * 1000$$

Where

$$s = \frac{(a + b + c)}{2}$$

$$a = \sqrt{\left(x'_{blue} - x'_{red} \right)^2 + \left(y'_{blue} - y'_{red} \right)^2}$$

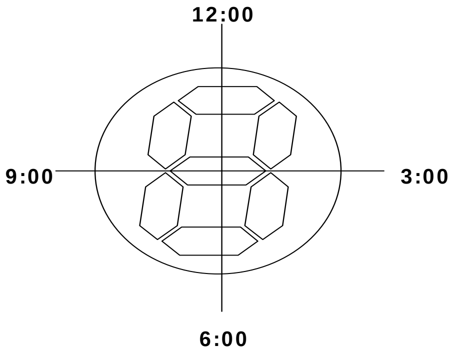
$$b = \sqrt{\left(x'_{blue} - x'_{green} \right)^2 + \left(y'_{blue} - y'_{green} \right)^2}$$

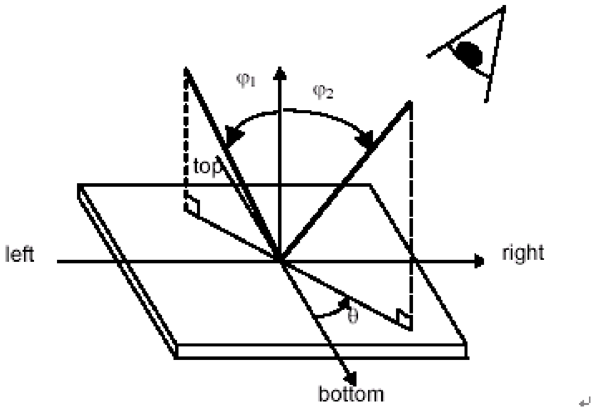
$$c = \sqrt{\left(x'_{red} - x'_{green} \right)^2 + \left(y'_{red} - y'_{green} \right)^2}$$

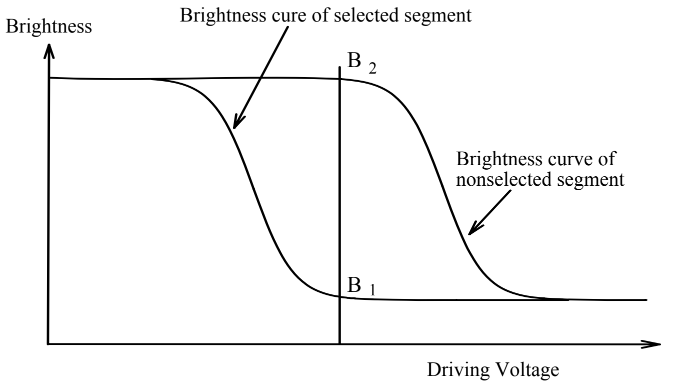
Color Gamut Ratio (NTSC) related to NTSC':
NTSC: =F (display)/F (NTSC')
NTSC' primaries:

	x'	y'
Red	**0.67**	**0.33**
Green	**0.21**	**0.71**
Blue	**0.14**	**0.08**

F (NTSC') =74.42


12:00
9:00
3:00
6:00


φ1
φ2
top
left
right
θ
bottom



Perpendicular line (θ=90°)

◆ SPECIFICATION OF QUALITY ASSURANCE

● Summary

The customer should check and accept the products of BYD within one month after reception. This standard for quality assurance should affirm the quality of LCD products to supply to purchaser by BYD COMPANY LIMITED. Entire process is controlled according to ISO9001.

● Warranty period

Warranty period of this product is 12 months from manufacture code.

● Standard for quality test

1、 Inspection
Before delivering, the supplier should take the following test, and confirm the quality of product.
2、 Electro-Optical Characteristics
According to the individual specification to test the product.
3、 Test of Appearance Characteristics:
According to the individual specification to test the product.
4、 Test of Reliability Characteristics
According to the definition of reliability on specification for test product.
5、Delivery Test
Before delivering, the supplier should take the delivery test

6、Sampling Method: GB/T2828.1-2003, Level II
7、The defects classify of AQL as following

Major defect : AQL=0.65

Minor defect:: AQL= 1.5

● Nonconforming Analysis & Deal With Manners

✧ Nonconforming Analysis
1、 Purchaser should supply the detail data of nonconforming sample and the non-suitable state.
2、 After accepting the detail data from purchaser ,the analysis of nonconforming should be finished in two weeks.
3、 If supplier can not finish analysis on time ,must announce purchaser before two weeks.
✧ Disposition of nonconforming
1、 If find any supplier defect during assembly line, supplier must change the good product for every defect after recognition.
2、Both supplier and customer should analysis the reason and discuss the disposition of nonconforming when the reason of nonconforming is not sure.

● Agreement items.

Both sides should discuss together when the following problems happen:
1、 There is any problem of standard of quality assurance, and both sides think that must be modifier.
2、There is any argument item which does not record in the quality assurance.
3、Any other special problem.

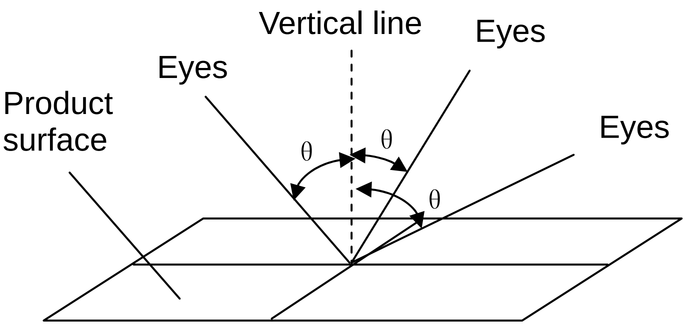
● Standard of the Product Appearance Test

■ Manner of appearance test
1、 The test must be under 20W*2 or 40W fluorescent light ,and the distance of view must be at 30±5

cm;

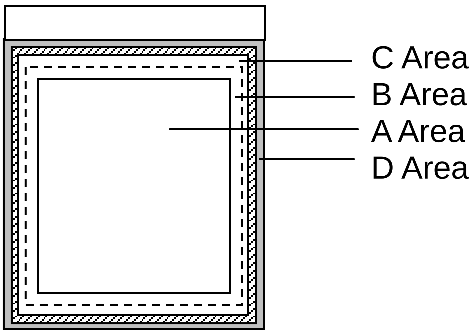
2、 When test the model of Transmissive product must add the reflective plate.

3、 The test direction is base on about around 30 degree(within θ range)of vertical line, and the test time is below 5s.



4、Definition of Area:

A Area: Active area
B Area: Viewing area
C Area: Out of viewing area
D Area: Seal area



Note:
A: Active Area is drawn in the drawing
B: Viewing Area border is 2mm from Active Area border

- Basic principle:

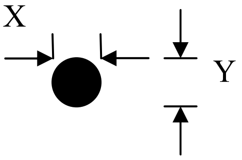
1、 It will accord to the AQL when the standard can not be described.

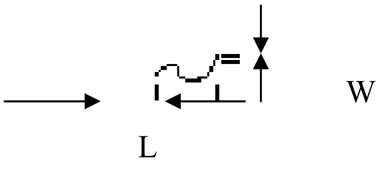
2、 The sample of the lowest acceptable quality level must be discussed by both supplier and customer when any dispute happened.

3、 Must add new item on time when it is necessary.

- **Inspection specification**

NO	Item	Criterion	AQL
01	Electrical Testing	1.1 Missing vertical, horizontal segment, segment contrast defect. 1.2 Missing character, dot or icon. 1.3 Display malfunction. 1.4 No function or no display.	

<table>
<tr><td></td><td></td><td>1.5 Current consumption exceeds product specifications.
1.6 LCD viewing angle defect.
1.7 Contrast defect</td><td>0.65</td></tr>
<tr><td>02</td><td>LCM black spots, white spots, bright spots, contamination, (display/non-display)</td><td>As following drawing
$\Phi=(x+y)/2$


<table>
<tr><th></th><th>Size</th><th>Acceptable QTY</th><th>Remark</th></tr>
<tr><td>Common dots defect</td><td>Φ≦0.15</td><td>Ignore</td><td>/</td></tr>
<tr><td></td><td>0.15 <Φ≦0.25</td><td>2</td><td>more than 5mm between two defects</td></tr>
<tr><td></td><td>0.25 <Φ≤0.3</td><td>1</td><td>/</td></tr>
<tr><td></td><td>0.3 <Φ</td><td>0</td><td>/</td></tr>
</table></td><td rowspan="2">1.5</td></tr>
<tr><td>03</td><td>Scratches, line type contamination (display/non-display)</td><td>As following drawing


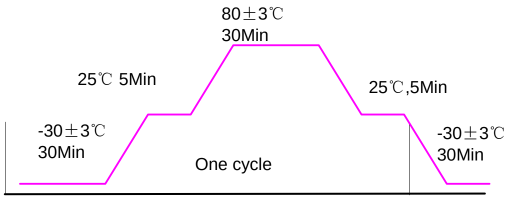
<table>
<tr><th>Length</th><th>Width</th><th>Acceptable QTY</th><th>Remark</th></tr>
<tr><td>---</td><td>W≦0.03</td><td>Ignore</td><td>/</td></tr>
<tr><td>L≦3.5</td><td>0.03< W≦0.05</td><td>3</td><td rowspan="2">More than 5mm between two defects</td></tr>
<tr><td>L≦3</td><td>0.05< W≦0.08</td><td>3</td></tr>
<tr><td>---</td><td>0.08< W</td><td>0</td><td>/</td></tr>
</table></td></tr>
</table>

<table>
<tr>
<td>04</td>
<td>Polarizer bubbles</td>
<td>If bubbles are visible, judge using black spot specifications, not easy to find, must check in specify direction.
<table>
<tr><td>Size</td><td>Acceptable QTY</td><td>Remark</td></tr>
<tr><td>Φ≦0.5 0</td><td>ignore</td><td>/</td></tr>
<tr><td>0.5<Φ≤1.0</td><td>2</td><td>**More than 5mm between two defects**</td></tr>
<tr><td>1.0<Φ</td><td>0</td><td>/</td></tr>
</table>
</td>
<td>1.5</td>
</tr>
<tr>
<td rowspan="5">05</td>
<td rowspan="3">TP black spots, white spots, concavo-convex spots, scratches (display/non-display)</td>
<td>5.1 spots
<table>
<tr><td>Size</td><td colspan="2">Acceptable QTY</td></tr>
<tr><td>Φ≦0.2</td><td>ignore</td><td></td></tr>
<tr><td>0.2 <Φ≦0.3</td><td>2</td><td>More than 5mm between two defects</td></tr>
<tr><td>0.3 <Φ</td><td>0</td><td></td></tr>
</table>
</td>
<td>1.5</td>
</tr>
<tr>
<td>5.2 lines(not scratch): L:Length; W:Width
<table>
<tr><td>L≦10</td><td>W≦0.05</td><td>Ignore</td><td>/</td></tr>
<tr><td>L≦10</td><td>0.05< W≦0.10</td><td>2</td><td>More than 5mm between two defects</td></tr>
<tr><td>------</td><td>0.1< W</td><td>0</td><td>/</td></tr>
</table>
</td>
<td>1.5</td>
</tr>
<tr>
<td>5.3 lines(scratch): L:Length; W:Width
<table>
<tr><td>W≦0.03</td><td>Ignore</td><td>/</td></tr>
<tr><td>L≦2.0, 0.03< W≦0.05</td><td>2</td><td rowspan="2">More than 5mm between two defects</td></tr>
<tr><td>L≦1.0, 0.05< W≦0.1</td><td>2</td></tr>
<tr><td>L≥2.0, W≥0.05 or L≥1.0, W≥0.1</td><td>0</td><td>/</td></tr>
</table>
</td>
<td>1.5</td>
</tr>
<tr>
<td>TP Newton's ring and Interference fringes</td>
<td>a: Area of Newton's ring and Interference fringes
A: Whole TP surface
a≦1/2*A</td>
<td>1.5</td>
</tr>
<tr>
<td>TP Position disabled or losing</td>
<td>Not allowed</td>
<td>1.5</td>
</tr>
</table>

06	Backlight elements	6.1 Illumination source flickers when lit. 6.2 Spots or scratches that appear when lit must be judged using LCD spot, lines and contamination standards. 6.3 Backlight doesn’t light or color is wrong	0.65 1.5 0.65
07	Soldering	7.1 No unmelted solder paste may be present on the PCB. 7.2 No cold solder joints, missing solder connections, oxidation or icicle. 7.3 No residue or solder balls on PCB. 7.4 No short circuits in components on PCB.	0.65 0.65 1.5 0.65
08	General appearance	8.1 No oxidation, contamination, curves or, bends on interface pin (OLB) of FPC 8.2 No cracks on interface pin(OLB) of FPC 8.3 NO contamination, solder residue or solder balls on product. 8.4 The IC on the FPC may not be damaged, circuits. 8.5 The residual rosin or tin oil of soldering (component or chip component) is not burned into brown or black color. 8.6 Sealant on top of the ITO circuit has not hardened 8.7 Pin type must match type in specification sheet. 8.8 LCD pin loose or missing pins. 8.9 Product packaging must the same as specified on packaging specification sheet. 8.10 Product dimension and structure must conform to product specification sheet.	1.5 0.65 1.5 0.65 1.5 1.5 1.5 0.65 1.5 1.5

◆ RELIABILITY

1. Environmental Test

No	Test Item	Test Condition& Criteria	Sample Size	Determinant Stand.
1-1	High Temperature Operation	Temperature:70±3℃; Humidity: Except; Test method: Operation Duration: 96Hrs	Sample Do:≥2PCS On Going:≥3PCS/ LOT	TS
1-2	Low temperature Operation	Temperature:-20±3℃; Humidity: Except; Test method: Operation Duration: 96Hrs	Sample Do:≥2PCS On Going:≥3PCS/ LOT	TS
1-3	High Temperature / High Humidity Operation	Temperature:60±3℃; Humidity: 95%±3%RH; Test method: Operation Duration: 96Hrs	Sample Do:≥2PCS On Going:≥3PCS/ LOT	TS
1-4	Temperature Shock	Shock Temperature & Time:  Duration: 20cycle	Sample Do:≥2PCS On Going:≥3PCS/ LOT	TS
1-5	Temperature Cycle	Normal temperature 2H→-30±3℃,10H(3H) →60±3℃,90±3%,RH10H(3H) →80±3℃,10H(2H) →(25℃) 5 cycles	Sample Do:≥2PCS On Going:≥3PCS/ LOT	TS

Item	FAULT JUDGMENT CRITERIA
TS	1. No clearly visible defects or deterioration of display quality allowed. 2. No function – related abnormalities.

NOTE:

1. When temperature moves, LCD’s valve voltage will be influenced by it, which leads to LCD's contrast and chroma change.

2. In high temperature operation and storage tests in MQE test will make LCD's power consumption increase. The reason is that a few crystal molecules are apart because of high temperature when there is a long time storage and operation in high temperature, which leads to decrease of gross resistance ratio of crystal molecules.Hence, LCD’s power consumption go up than that of before test.

2. Mechanical Reliability Test

No.	Test Item	Test Condition& Criteria	Sample Size	Determinant Spec.
2-1	ESD test	Discharge modality: Contact voltage:±1KV、±2KV; Air voltage: ±2KV、±4KV、±6KV; (Discharge R=330Ω;C=150PF)	2PCS	No software error

3. Soldering

(1) Soldering temperature: 340+/-10℃.

(2) Available times for repeated soldering: 5 times

(3) Attentions paid when soldering:

A. FPC's golden finger and soldering pad are butt-jointed before soldered. Tolerance is within the 1/3 width of golden finger and 0.5~1mm of FPC's length is allowed to be exposed in the jointed soldering pad.

B. Coat proper tin in the iron-head when soldering, with dragging speed of 2.5cm/sec.

C. The soldering part is warmed up first with iron-head when there is a rework. Then heat it up from one side until tin is melted, last, take off FPC.

4. FPC cable flexing and bending test

Number of Bending / Flexing Cycles: <10 times

Radius of the Bend Mandrels: >0.4 mm

Degree of Bend: <180°

◆ SUGGESTIONS FOR USING LCD MODULES

● Handling of LCM

(1) The LCD screen is made of glass. Don't give excessive external shock, or drop from a high place.

(2) If the LCD screen is damaged and the liquid crystal leaks out, do not lick and swallow. When the liquid is attach to your hand, skin, cloth etc, wash it off by using soap and water thoroughly and immediately.

(3) Don't apply excessive force on the surface of the LCM.

(4) If the surface is contaminated, clean it with soft cloth. If the LCM is severely contaminated, use Isopropyl alcohol/Ethyl alcohol to clean. Other solvents may damage the polarizer. The following solvents are especially prohibited: water, ketone Aromatic solvents etc.

(5) Exercise care to minimize corrosion of the electrode. Corrosion of the electrodes is accelerated by water droplets, moisture condensation or a current flow in a high-humidity environment.

(6) Install the LCD Module by using the mounting holes. When mounting the LCD module make sure

it is free of twisting, warping and distortion. In particular, do not forcibly pull or bend the I/O cable or the backlight cable.

(7) Don’t disassemble the LCM.

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

- Be sure to ground the body when handling the LCD modules.
- Tools required for assembling, such as soldering irons, must be properly grounded.
- To reduce the amount of static electricity generated, do not conduct assembling and other work under dry conditions.
- The LCD module is coated with a film to protect the display surface. Exercise care when peeling off this protective film since static electricity may be generated.

(9) Do not alter, modify or change the shape of the tab on the metal frame.

(10) Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.

(11) Do not damage or modify the pattern writing on the printed circuit board.

(12) Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector

(13) Except for soldering the interface, do not make any alterations or modifications with a soldering iron.

(14) Do not drop, bend or twist LCM.

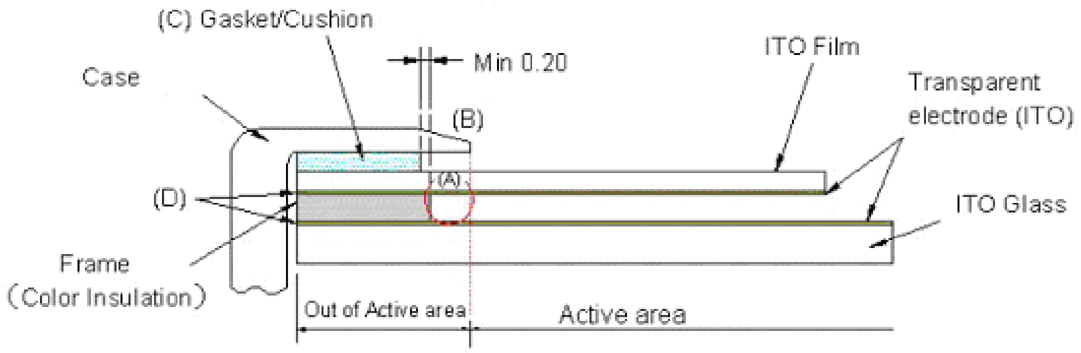
(15) If the LCM is assembled with touch panel, pay more attention to using touch panel.

* Please wear clean finger sacks, gloves and mask to protect the products from fingerprint or stain attach, and also hold the portion outside the view area when handling the panel.

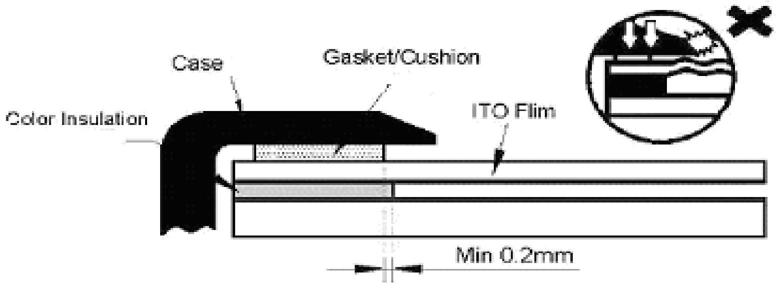
* Please use finger sacks or gloves to avoid injuries by sharp edges when handling the Film-Glass type touch panel because a glass edges are not chamfered.

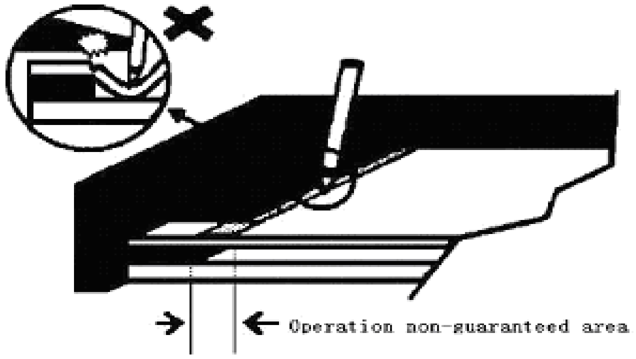
* Cautions for installing and assembling

- Do not give excessive strain to the product.
- Flexible pattern cable is connected to the TP body by heat-seal(thermal pressure) method. So, do not apply excessive forces to the flexible pattern.
- In order not to apply load on the surface of the touch panel, please keep a clearance of 0.2mm-0.5mm between product and case.
- Pressing inside of boundary of the frame(part(A) as shown in below) may cause fault operation, so please design to avoid pressing of touch panel at part (A) such as having gasket/cushion at part (C). Particularly the area (B) shall be free from burr. The gasket/cushion material at the part (C) should not be exceeded to inside of the boundary of the frame.

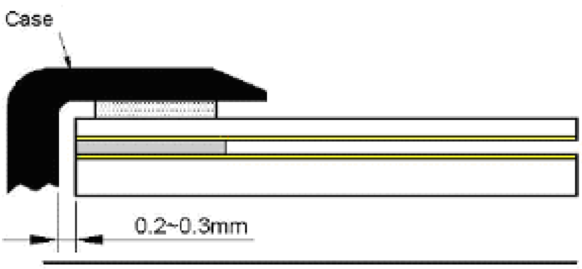

(C) Gasket/Cushion
Min 0.20
ITO Film
Case
Transparent electrode (ITO)
(B)
(A)
(D)
ITO Glass
Frame (Color Insulation)
Out of Active area
Active area

Do not make the following mistakes:

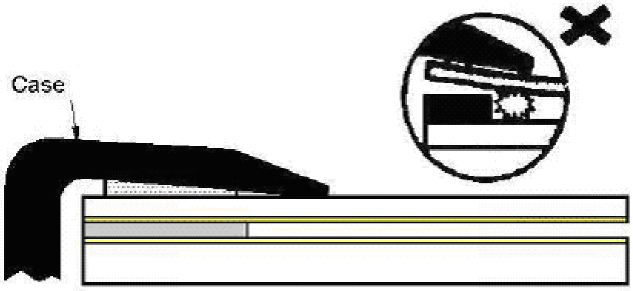

Case
Gasket/Cushion
Color Insulation
ITO Flim
Min 0.2mm


Operation non-guaranteed area

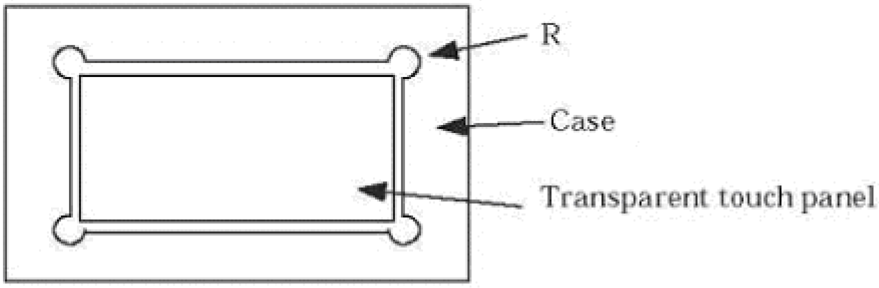
- When designing installment of case and touch panel, you would better consider to keep clearance of 0.2-0.3mm between touch panel and inside boundary of case.


Case
0.2~0.3mm

- Please keep your case flat in order not to touch with touch panel directly which causes serious damage of a transparent electrode.



- Do not use any organic solvent or detergent other than ethanol.
- The corners of the product are not chamfered. When positioning and fixing the product on the case, we suggest that you would provide a R part on the corner of the case so as net to apply load on the corner of the transparent touch panel.



- Please confirm its characteristic in advance whether any damage is given to this product when attaching a protection sheet on this product at customer side. Some changes may arise in the characteristics of this product by the protection sheet attachment such as operation, cosmetic, etc.. However, those changes are out of our guarantee.

● Storage

(1) Store in an ambient temperature of 5 to 45 °C, and in a relative humidity of 40% to 60%. Don't expose to sunlight or fluorescent light.

(2) Storage in a clean environment, free from dust, active gas, and solvent.

(3) Store in antistatic container.

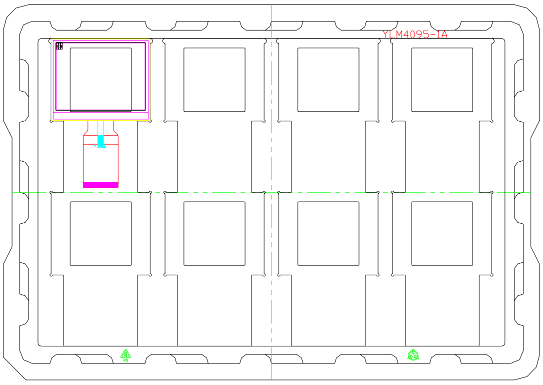
◆ PACKING

- **Packing Materials**

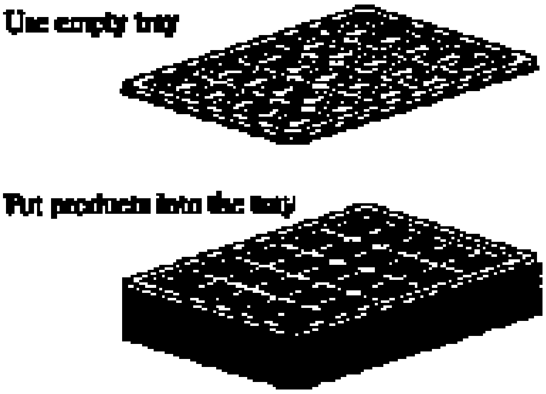
NO.	ITEM	Dimension(LXWXH) (mm)	Quantity
1	Tray	424X295X12	TBD
2	Carton	437X307X163	TBD

- **Packing Method**

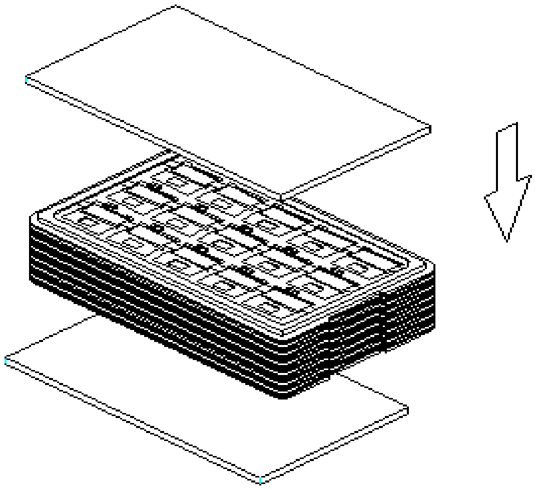
(1)



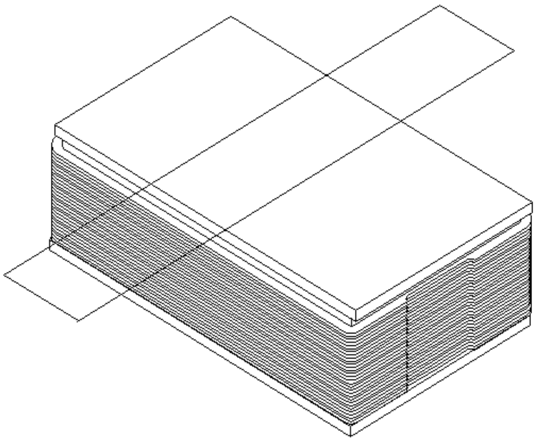
(2)


Use empty tray
Put products into the tray

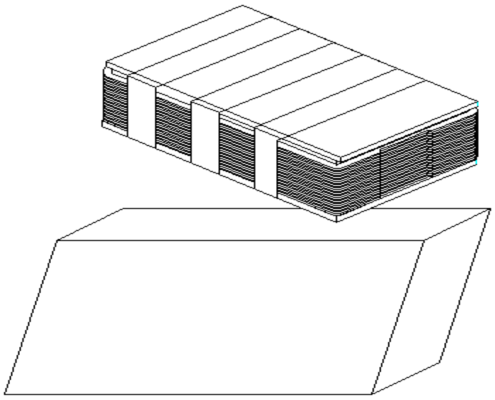
(3)



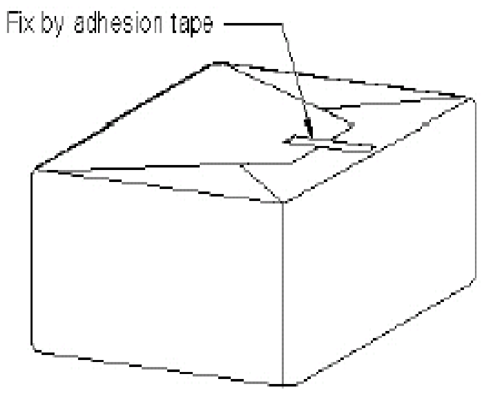
(4)



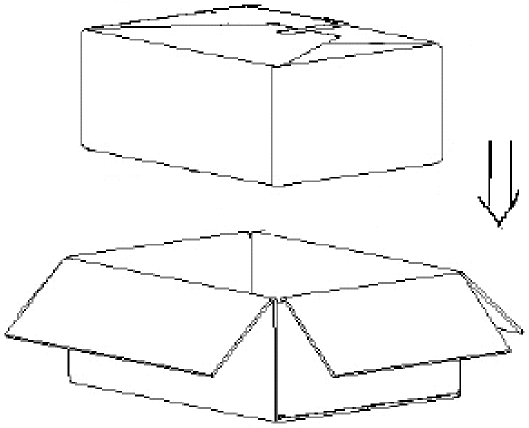
(5)



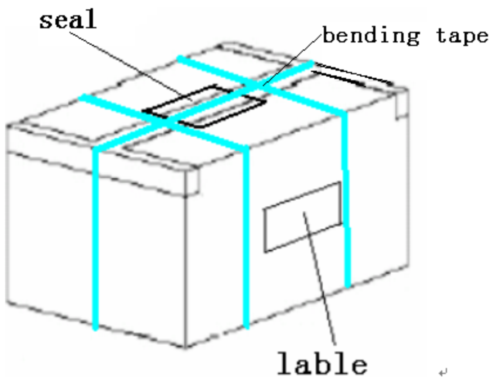
(6)



(7)



(8)



(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 and 4 pcs desiccant into the LDPE bag
(6). Fix the LDPE bag with adhesive tape:
(7). Put LDPE bag with tray stack into carton.:
(8). Carton sealing with adhesive tape.

◆ ENVIRONMENT-RELATED SUBSTANCES

- Meet with BYD Environment-Related Substances Controlled Standard BHS-001