

# Duobond Display Technology Co.,Ltd

## PRODUCT SPECIFICATION

MODEL NAME: DBT231QA033S

Date: 2020/09/14

Version: 1.0

Preliminary Specification

Final Specification

FOR CUSTOMER	
CUSTOMER APPROVED	

PREPARED BY	CHECKED BY	APPROVED BY	DATE



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## 1. General Features

Item	Display Panel	Unit/note
Display Mode	Normally White, Transmissive LCD	
LCM size	2.31"	
Viewing Direction	12 O'CLOCK	
Input Signals	SPI	
Outline Dimensions	45.8 (W)* 51(H)*2.5 (T)	mm
Active Area	35.06 (H)×46.75(W)	mm
Number of Pixels	320×RGB×240	Pixels
Pixel Arrangement	RGB Vertical stripes	
Drive IC	ILI9342C	
Input voltage	2.8	V

## 2. Absolute Maximum Ratings

ITEM	Symbol	Min.	Typ.	Max.	Unit	Remark
Power for Circuit Driving	V <sub>CC</sub>	-0.3	-	4.6	V	
Power for Circuit Logic	V <sub>t</sub>	-0.3	-	V <sub>CC</sub> +0.3	V	
LC Operating Voltage *1)	V <sub>OP</sub>	-	5	-	V	
Storage Humidity	H <sub>ST</sub>	10	-	*2)	%RH	At 25±5°C
Storage Temperature	T <sub>ST</sub>	-30	-	80	°C	
Operating Ambient Humidity	H <sub>OP</sub>	10	-	*3)	%RH	
Operating Ambient temperature	T <sub>OP</sub>	-20	-	70	°C	

### 3. Electrical Specification

(Unless specified, the ambient temperature Ta=25°C)

Properties		Sym.	Min	Typ.	Max	Unit	Note
Power for Circuit Driving		Vcc	1.5	1.8	3.5	V	Note
Power for Circuit Logic		Vt	2.7	3.2	3.5	V	Note
BLU Driving Logic		Vbat	-	3.2	-	V	
Logic Input Voltage	Low Voltage	VIL	-0.3	-	0.2Vcc	V	
	High Voltage	VIH	0.8Vcc	-	Vcc	V	
Logic Output Voltage	Low Voltage	VOL	0	-	0.2Vcc	V	
	High Voltage	VOH	0.8Vcc	-	-	V	

Item	Symbol	Specification			Unit	Remark
		Min	Typ	Max		
TFT gate on voltage	VGH	-	15	-	V	
TFT gate off voltage	VGL	-	-10	-	V	

Note:

- (1) Vcom must be adjusted to optimize display quality: cross talk, contrast ratio and etc.
- (2) VGH is TFT gate operating voltage
- (3) VGL is TFT gate operating voltage  
The storage capacitance structure of this product is Cst(Storage on Common).  
The low voltage level of VGL signal must be fluctuated with same phase as Vcom, in case of Storage on Gate structure.
- (4) Environmental condition : 25°C.

### 4. TIMING OF POWER SUPPLY

Please refer to the driver IC specification.

### 5. BACKLIGHT CHARACTERISTICS

Properties	Sym.	Min	Typ.	Max	Unit	Not
Forward voltage	Vf	12	12.8	13.5	V	--
Luminance	Lv	350	400		Cd/m <sup>2</sup>	--
Electric current	If	15	20	--	mA	--
Number of LED	--	4			piece	--
Connecton mode	p	--			--	--

## 6. Optical Specification

Optical characteristics are determined after the unit has been 'ON' and stable for approximately 30 minutes in a dark environment at 25 °C. The values specified are at an approximate distance 500mm from the LCD surface at a viewing angle of  $\Phi$  and  $\theta$  equal to 0°.

Measurement condition:

\*1):with Polarizer

\*2):without Polarizer

\*3):only color filter glass

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note	
Transmittance (without Polarizer)	T(%)	—	—	15.20%	—	—		
Contrast Ratio	CR	$\theta=0$	400	500	—	—	(1)(2)	
Response time	Rising	$T_R$	Normal viewing angle	—	4	8	msec	(1)(3)
	Falling	$T_F$		—	12	20		
Color gamut	S(%)			50		%		
Color chromaticity (CIE1931)	White	$W_x$		0.283	0.303	0.323	(1)(4) CF glass	
		$W_y$		0.304	0.324	0.344		
	Red	$R_x$		0.589	0.609	0.629		
		$R_y$		0.310	0.330	0.350		
	Green	$G_x$		0.267	0.287	0.307		
		$G_y$		0.507	0.527	0.547		
Blue	$B_x$		0.127	0.147	0.167			
	$B_y$		0.118	0.138	0.158			
Viewing angle	Hor.	$\theta_L$	CR>10	60	70	—	Viewing Angle base on using EWV Polarizer · Reference Only	
		$\theta_R$		60	70	—		
	Ver.	$\theta_U$		60	70	—		
		$\theta_D$		50	60	—		
Optima View Direction	12 O'clock						(5)	

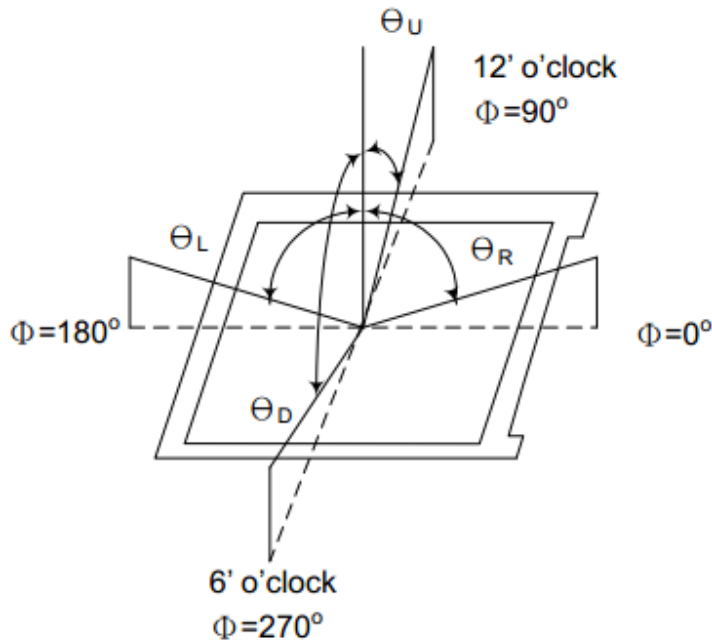
### Measuring Condition

- Measuring surrounding : dark room
- Ambient temperature : 25±2°C
- 15min. warm-up time.

**Measuring Equipment**

FPM520 of Westar Display technologies, INC., which utilized SR-3 for Chromaticity and BM-5A for other optical characteristics.

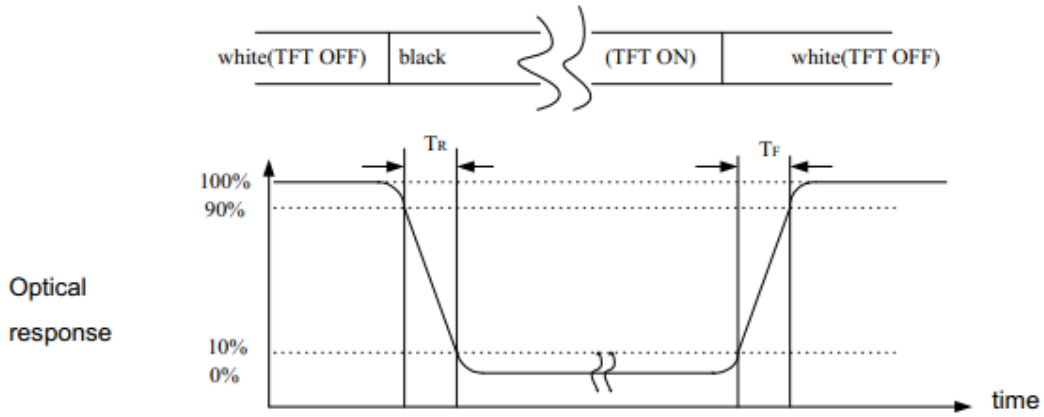
**Note (1)** Definition of Viewing Angle :



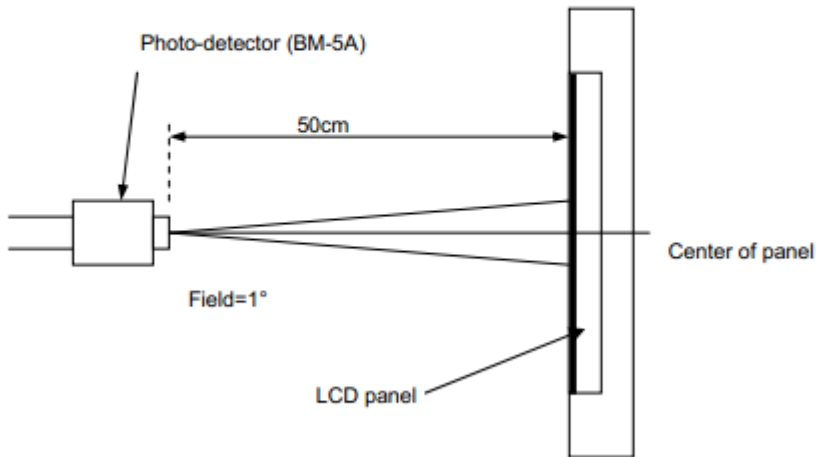
**Note (2)** Definition of Contrast Ratio(CR) :  
measured at the center point of panel

$$CR = \frac{\text{Luminance with all pixels white}}{\text{Luminance with all pixels black}}$$

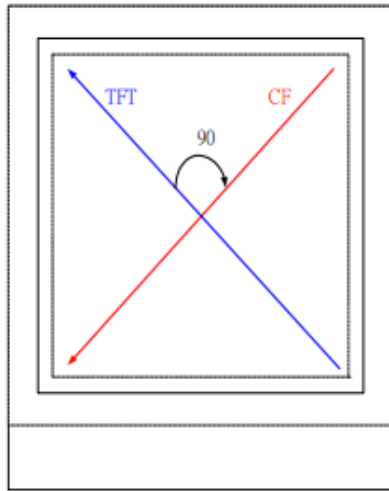
**Note (3)** Definition of Response Time : Sum of  $T_R$  and  $T_F$



**Note (4)** Definition of optical measurement setup



**Note (5)** Rubbing Direction (The different Rubbing Direction will cause the different optima view direction.)



TFT Face up

## 7. Interface Description

Pin NO.	Symbol	Description	Remark
1	GND	GND	Power ground
2	RESET	I	LCD Reset Terminal active “L”
3	SCL	I	This pin is used as the serial interface clock
4	A0	I/O	This pin is used to select “Data or Command”
5	CS	I/O	Chip select input pin
6	SDA	I/O	The data is applied on the rising edge of the SCL signal.
7	SDO(NC)		NC
8	GND	P	Power ground
9	VCC	P	High voltage power supply for analog circuit blocks
10	LEDA	P	Anode for back light driver voltage
11	LEDK	P	Cathode for back light driver voltage
12	LEDK	P	Cathode for back light driver voltage
13	LEDK	P	Cathode for back light driver voltage
14	LEDK	P	Cathode for back light driver voltage
15	NC		NC
16	NC		NC
17	NC		NC
18	NC		NC

## 8. Outline Dimension

Customer No: CUSTOMER\_NO.:

PIN	DESCRIPTION
1	GND
2	RESET
3	SCL
4	A0
5	CS
6	SDA
7	SDO(NC)
8	GND
9	VCC
10	LED-A
11	LED-K
12	LED-K
13	LED-K
14	LED-K
15	NC
16	NC
17	NC
18	NC

FPC 弯折示意图  
FPC展开出货

上宽视角亮片  
下宽视角砂片

PRODUCT NO.	DBT231QA033S
DVN	DSN
CHKD	APPD
NOO	FIRST ISSUE
NOI	CONTENT
	DATE
	NOT IN SCALE mm
	SHEET: 1/1

IP=80mA VR=3.2V

POLARIZER SIZE	TRANSMISSIVE
Display Resolution	DOTS: 320(R.G.B)*240
Viewing Angle	12 O'clock
LCD Controller/Driver	ILI9342C
BACKLIGHT	4CHIP-WHITE_LED
Operation Temperature	-20°C ~ 70°C
Storage Temperature	-30°C ~ 80°C

### 9. initialization Setup

Please consult our technical department for detail information.

## 10. Reliability and Inspection Standard

11. No	Test Item	Condition	Remarks
1	High Temperature Operation	Ts = +70°C, 120 hours	IEC60068-2-1:2007 GB2423. 2-2008
2	Low Temperature Operation	Ta = -20°C, 120 hours	IEC60068-2-1:2007 GB2423. 1-2008
3	High Temperature Storage	Ta = +80°C, 120 hours	IEC60068-2-1:2007 GB2423. 2-2008
4	Low Temperature Storage	Ta = -30°C, 120 hours	IEC60068-2-1:2007 GB2423. 1-2008
5	Storage at High Temperature and Humidity	Ta = +60°C, 90% RH max, 120hours	IEC60068-2-78 :2001 GB/T2423. 3—2006
6	Thermal Shock (non-operation)	-30°C 30 min~+80°C 30 min, Change time:5min, 20 Cycle	Start with cold temperature, End with high temperature, IEC60068-2-14:1984, G B2423. 22-2002
7	ESD	C=150pF, R=330 Ω, 5point/panel Air: ±8Kv, 5times; Contact: ±4Kv, 5times (Environment:15°C~35°C, 30%~60%. 86Kpa~106Kpa)	IEC61000-4-2:2001 GB/T17626. 2-2006
8	Vibration Test	Frequency range:10~55Hz Stroke:1.5mm Sweep:10Hz~55Hz~10Hz 2 hours for each direction of X. Y. Z. (6 hours for total)	IEC60068-2-6:1982 GB/T2423. 10—1995
9	Mechanical Shock (Non Op)	Half Sine Wave 60G 6ms, ±X, ±Y, ±Z 3times for each direction	IEC60068-2-27:1987 GB/T2423. 5—1995
10	Package Drop Test s	Height:80cm, 1corner, 3edges, 6surface	IEC60068-2-32:1990 GB/T2423. 8—1995

Note1: Ts is the temperature of panel' s surface.

Note2: Ta is the ambient temperature of samples.

## 12. Inspection Criterion

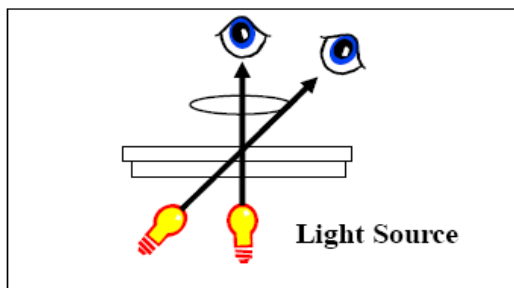
### 11.1. Sampling Method

Unless otherwise agreed upon in writing, the sampling inspection shall be applied to the Customer's incoming inspection.

- 1) Lot size: Quantity per shipment lot
- 2) Sampling type: Normal inspection , single sampling
- 3) Inspection level: II
- 4) Sampling table: MIL-STD-105D
- 5) Acceptable Quality Level(AQL): Major=0.65 Minor=1.5

### 11.2. Inspection Method

- 1) Ambient Condition:
  - a. Temperature: Room temperature  $25\pm 5^{\circ}\text{C}$
  - b. Illumination: Single fluorescent lamp non-directive(300 to 700 Lux)
- 2) Viewing distance  
The distance between the LCD and the inspector' s eyes shall be at least 30-50cm.
- 3) Viewing Angle  
The inspection shall be conducted within normal viewing angle range.

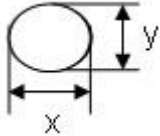



### 11.3. Inspection Criteria

#### 11.3.1. Major defect

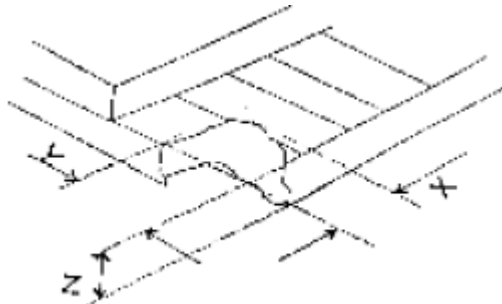
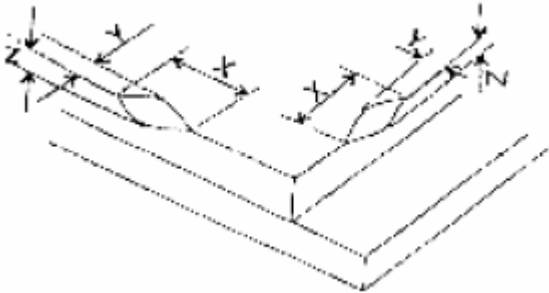
No.	Item	Inspection Standard	Classification of defects
1	All functional defects	1) No display 2) Display abnormally 3) Open or missing segment 4) Short circuit 5) Excess power consumption 6) Backlight no lighting, flickering and abnormal lighting	Major
2	Missing	Missing component	Major
3	Outline dimension	Overall outline dimension beyond the drawing is not allowed	Major

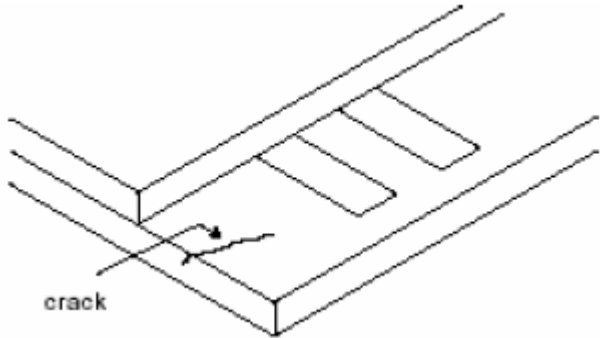
**11.3.2. Cosmetic Defect**

No.	Item	Inspection Standard		Classification of defects							
1	(spot defect) Black and White spot pinhole	For dark/white spot, size $\Phi$ is defined as $\Phi=(x+y)/2$		Minor							
		<table border="1"> <thead> <tr> <th>Size <math>\Phi</math> (mm)</th> <th>Acceptable Quantity</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.1</math></td> <td>Ignore</td> </tr> <tr> <td><math>0.10 \leq \Phi \leq 0.15</math></td> <td>2</td> </tr> <tr> <td><math>0.15 \leq \Phi \leq 0.2</math></td> <td>1</td> </tr> <tr> <td><math>0.2 &lt; \Phi</math></td> <td>0</td> </tr> </tbody> </table>			Size $\Phi$ (mm)	Acceptable Quantity	$\Phi \leq 0.1$	Ignore	$0.10 \leq \Phi \leq 0.15$	2	$0.15 \leq \Phi \leq 0.2$
Size $\Phi$ (mm)	Acceptable Quantity										
$\Phi \leq 0.1$	Ignore										
$0.10 \leq \Phi \leq 0.15$	2										
$0.15 \leq \Phi \leq 0.2$	1										
$0.2 < \Phi$	0										
2	(line defect) Black and White line Polarizer scratch	Define: 	Minor								
		<table border="1"> <thead> <tr> <th>Width(mm)</th> <th>Length(mm); Acceptable Qty</th> </tr> </thead> <tbody> <tr> <td><math>\Phi \leq 0.03</math></td> <td>Ignore</td> </tr> <tr> <td><math>0.03 &lt; W \leq 0.05</math></td> <td><math>L \leq 3.0</math>; <math>N \leq 2</math></td> </tr> <tr> <td><math>0.05 &lt; W \leq 0.1</math></td> <td><math>L \leq 2.0</math>; <math>N \leq 2</math></td> </tr> <tr> <td><math>0.1 &lt; W</math></td> <td>Define as spot defect</td> </tr> </tbody> </table>		Width(mm)	Length(mm); Acceptable Qty	$\Phi \leq 0.03$	Ignore	$0.03 < W \leq 0.05$	$L \leq 3.0$ ; $N \leq 2$	$0.05 < W \leq 0.1$	$L \leq 2.0$ ; $N \leq 2$
Width(mm)	Length(mm); Acceptable Qty										
$\Phi \leq 0.03$	Ignore										
$0.03 < W \leq 0.05$	$L \leq 3.0$ ; $N \leq 2$										
$0.05 < W \leq 0.1$	$L \leq 2.0$ ; $N \leq 2$										
$0.1 < W$	Define as spot defect										

3	Polarizer defect	Dent or bubble(between the polarizer and glass)		Minor
		Size $\Phi$ (mm)	Acceptable Qty	
		$\Phi \leq 0.10$	Ignore	
		$0.10 < \Phi \leq 0.20$	2	
		$0.20 < \Phi \leq 0.30$	1	
$0.30 < \Phi$	0			

**11.3.3. Cosmetic Defect**

No.	Item	Inspection Standard	Classification of defects						
1	Glass defect	1) Chip on the corner  <table border="1" data-bbox="475 1281 1177 1384"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> <tr> <td><math>\leq 3.0</math></td> <td><math>\leq S</math></td> <td><math>\leq T</math></td> </tr> </table> <p>Remark: S=contact pad length; T=the thickness of glass Chips on the corner of terminal shall not be allowed to extend into the ITO pad or expose perimeter seal. Acceptable Quantity <math>N \leq 2</math>.</p>	X	Y	Z	$\leq 3.0$	$\leq S$	$\leq T$	Minor
		X	Y	Z					
$\leq 3.0$	$\leq S$	$\leq T$							
2) Chip on the edge of glass  <table border="1" data-bbox="475 1966 1177 2022"> <tr> <td>X</td> <td>Y</td> <td>Z</td> </tr> </table>	X	Y	Z	Minor					
X	Y	Z							

		Ignore	≤0.5	≤T	
		Acceptable Quantity: N≤2			
		3) Creak Creaks tend to break are not allowed.			Minor
					

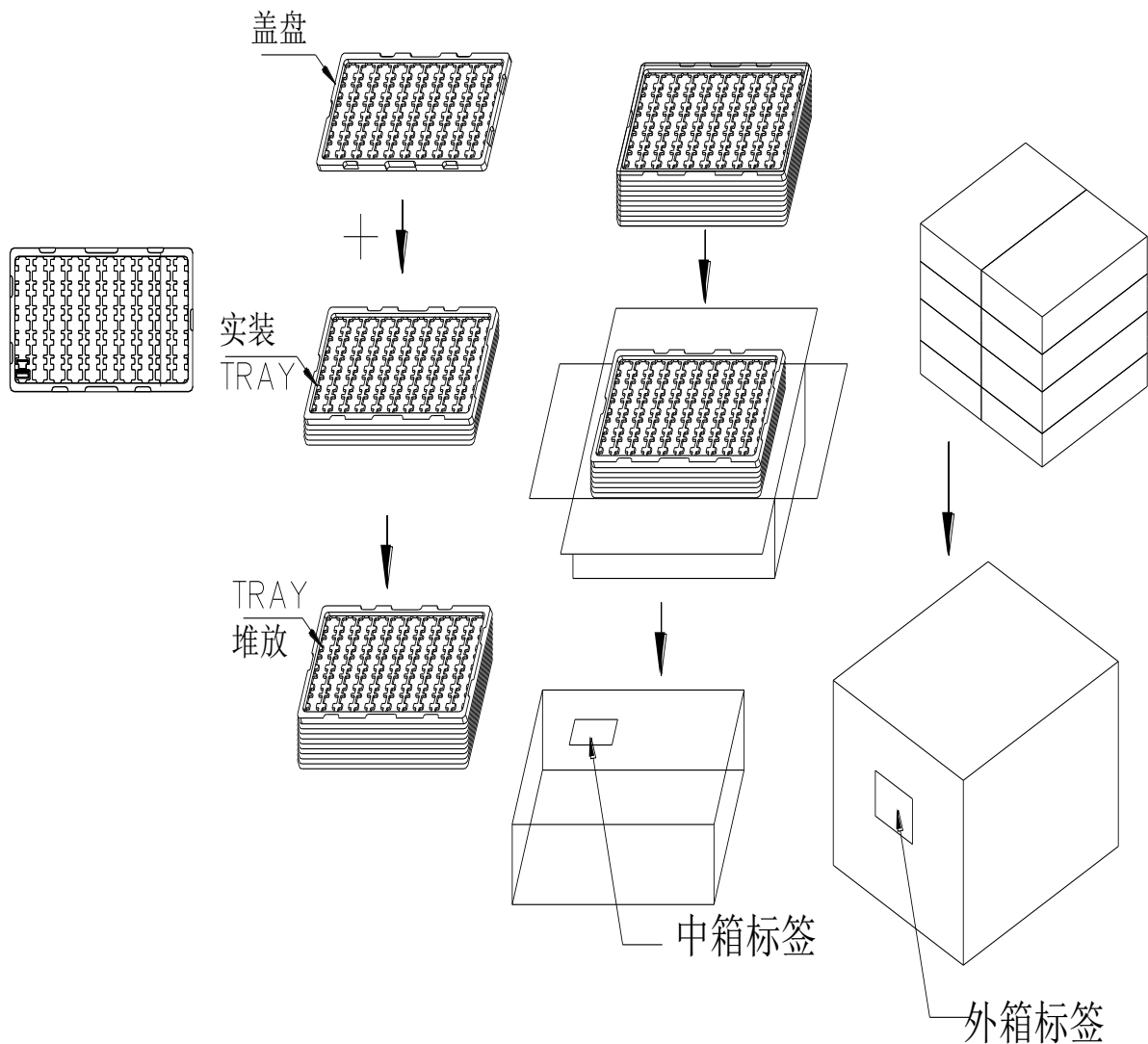
## 12. Packing Dimension

Packaging Quantity:

One tray Include: 17 pcs module;

One B-F Box Include: 10 pcs tray; 170 pcs Module;

One Carton Include: TBD-set B-F Box; TBD pcs tray; TBD pcs Module



## ■ PRECAUTIONS FOR USING LCD MODULES

### Handling Precautions

- (1) The display panel is made of glass and polarizer. As glass is fragile, it tends to become or chipped during handling especially on the edges. Please avoid dropping or jarring. Do not subject it to a mechanical shock by dropping it or impact.
- (2) If the display panel is damaged and the liquid crystal substance leaks out, be sure not to get any in your mouth. If the substance contacts your skin or clothes, wash it off using soap and water.

- (3) Do not apply excessive force to the display surface or the adjoining areas since this may cause the color tone to vary. Do not touch the display with bare hands. This will stain the display area and degraded insulation between terminals (some cosmetics are determined to the polarizer).
- (4) The polarizer covering the display surface of the LCD module is soft and easily scratched. Handle this polarizer carefully. Do not touch, push or rub the exposed polarizers with anything harder than an HB pencil lead (glass, tweezers, etc.). Do not put or attach anything on the display area to avoid leaving marks on. Condensation on the surface and contact with terminals due to cold will damage, stain or dirty the polarizer. After products are tested at low temperature they must be warmed up in a container before coming in contact with room temperature air.
- (5) If the display surface becomes contaminated, breathe on the surface and gently wipe it with a soft dry cloth. If it is heavily contaminated, moisten cloth with one of the following solvents
  - Isopropyl alcohol
  - Ethyl alcoholDo not scrub hard to avoid damaging the display surface.
- (6) Solvents other than those above-mentioned may damage the polarizer. Especially, do not use the following.
  - Water
  - Ketone
  - Aromatic solventsWipe off saliva or water drops immediately, contact with water over a long period of time may cause deformation or color fading. Avoid contacting oil and fats.
- (7) 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.
- (8) 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.
- (9) Do not attempt to disassemble or process the LCD module.
- (10) NC terminal should be open. Do not connect anything.
- (11) If the logic circuit power is off, do not apply the input signals.
- (12) Since LCM has been assembled and adjusted with a high degree of precision, avoid applying excessive shocks to the module or making any alterations or modifications to it.
  - Do not alter, modify or change the shape of the tab on the metal frame.
  - Do not make extra holes on the printed circuit board, modify its shape or change the positions of components to be attached.
  - Do not damage or modify the pattern writing on the printed circuit board.
  - Absolutely do not modify the zebra rubber strip (conductive rubber) or heat seal connector.
  - Except for soldering the interface, do not make any alterations or modifications with a soldering iron.
  - Do not drop, bend or twist LCM.

### Storage Precautions

When storing the LCD modules, the following precaution is necessary.

- (1) Store them in a sealed polyethylene bag. If properly sealed, there is no need for the dessicant.
- (2) Store them in a dark place. Do not expose to sunlight or fluorescent light, keep the temperature between 0°C and 35°C.
- (3) The polarizer surface should not come in contact with any other objects. (We advise you to store them in the container in which they were shipped).

### **Others**

Liquid crystals solidify under low temperature (below the storage temperature range) leading to defective orientation or the generation of air bubbles (black or white). Air bubbles may also be generated if the module is subject to a low temperature.

If the LCD modules have been operating for a long time showing the same display patterns, the display patterns may remain on the screen as ghost images and a slight contrast irregularity may also appear. A normal operating status can be regained by suspending use for some time. It should be noted that this phenomenon does not adversely affect performance reliability.

To minimize the performance degradation of the LCD modules resulting from destruction caused by static electricity etc., exercise care to avoid holding the following sections when handling the modules.

- Exposed area of the printed circuit board.
- Terminal electrode sections.