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SPEC. NUMBER

S8-64-8A-280

PRODUCT GROUP

TFT-LCD

REV.O

DATE

2020.02.27

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DV231FBQ-NV0 Product Specification Rev.O

BEIJING BOE OPTOELECTRONICS TECHNOLOGY Co., LTD



PRODUCT GROUP

REV.

DATE

TFT- LCD PRODUCT

0

2020.02.27

SPEC. NUMBER

S8-64-8A-280

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REVISION HISTORY

REV.	PAGE	DESCRIPTION OF CHANGES	DATE	PREPARED
0		Initial Release	Feb.27.2020	Tian Ming



PRODUCT GROUP

REV.

DATE

TFT- LCD PRODUCT

O

2020.02.27

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1.0 GENERAL DESCRIPTION

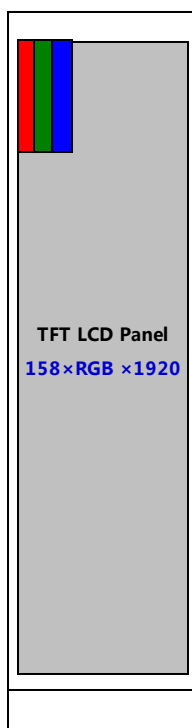
1.1 Introduction

DV231FBQ-NV0-DQP0 is a color active matrix TFT LCD.

Using amorphous silicon TFT's (Thin Film Transistors) as an active switching devices.

This module has a 23.1 inch diagonally measured active area with 158 horizontal by 1920 vertical pixel array.

Each pixel is divided into RED, GREEN, BLUE dots which are arranged in vertical stripe and this module can display 16.7M colors.



1.2 Features

- Cell Thickness : 1.0t
- Color Gamut : 68% @C light
- CR : 1000:1 (Typ.)
- Panel Border Width (L/R/U/D) : 4.2158/4.2158/3.1/3.504

1.3 Application

- Shelf sign Device

1.4 General Specification (H: horizontal length, V: vertical length)

The followings are general specifications at the **DV231FBQ-NV0-DQP0**

<Table 1. General Specifications>

Parameter	ITEMS	Unit	Remark
Active area	48.1584(H) × 585.216(V)	mm	
Dimensional Outline	593.82 (H)×56.59 (V)	mm	
Border(L/R/U/D)	4.2158/4.2158/3.1/3.504		
Number of pixels	158 (H) × 1920 (V)	pixels	
Pixel Arrangement	1P2D		
Pixel pitch	0.1016(H) × 0.3048(V)	mm	
Transmittance	4.0%(typ) 3.6% (Min)		without APF
Color Gamut	68%(typ) 64% (Min)		C Light(CF)
Display colors	16.7M		
Display mode	Normally Black		
Contrast Ratio	1000:1 (typ) 700:1(Min)		
Response Time	15ms (typ) 25ms(Max)	ms	
Optima Viewing Direction (Human Eye)	85/85/85/85	Deg.	CR>10
Weight		gram	

2.0 ABSOLUTE MAXIMUM RATINGS

The followings are maximum values which, if exceed, may cause faulty operation or damage to the unit. The operational and non-operational maximum voltage and current values are listed in Table 2.

<Table 2. Absolute Maximum Ratings >

Parameter	Symbol	Min.	Max.	Unit	Remarks
LC operating Voltage [Note1]	V_{OP}		TBD	V	Ta=25+/-5° C
Operating Temperature (Humidity)	T_{OP}	-5	+50	°C	[Note2]
	RH(60°)		80	%	
Storage Temperature (Humidity)	T_{ST}	-20	+60	°C	
	RH(60°)		90	%	

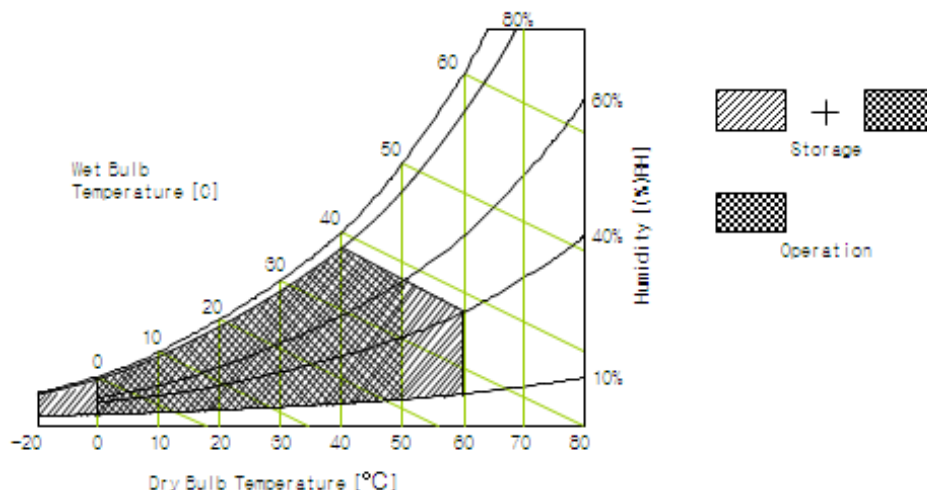
Note:

1. Liquid Crystal driving voltage

Due to the characteristics of LC Material, this voltage varies with environmental temperature.

2. Temperature and relative humidity range are shown in the figure below.

Wet bulb temperature should be 39 °C max. and no condensation of water.



3.0 ELECTRICAL SPECIFICATIONS

3.1 Electrical Specifications

<Table 3. Electrical specifications >

Parameter	Symbol	Value	Range	Unit	Remark
TFT Gate ON Voltage	VGH	33	TBD	V	Note1
TFT Gate OFF Voltage	VGL	-8	TBD	V	Note2
TFT Common Electrode Voltage	Vcom		TBD	V	Note3
TFT Kick-Back Voltage Max	ΔV_p Max	1.476	-	V	
TFT Kick-Back Voltage Min	ΔV_p Min	1.43	-	V	

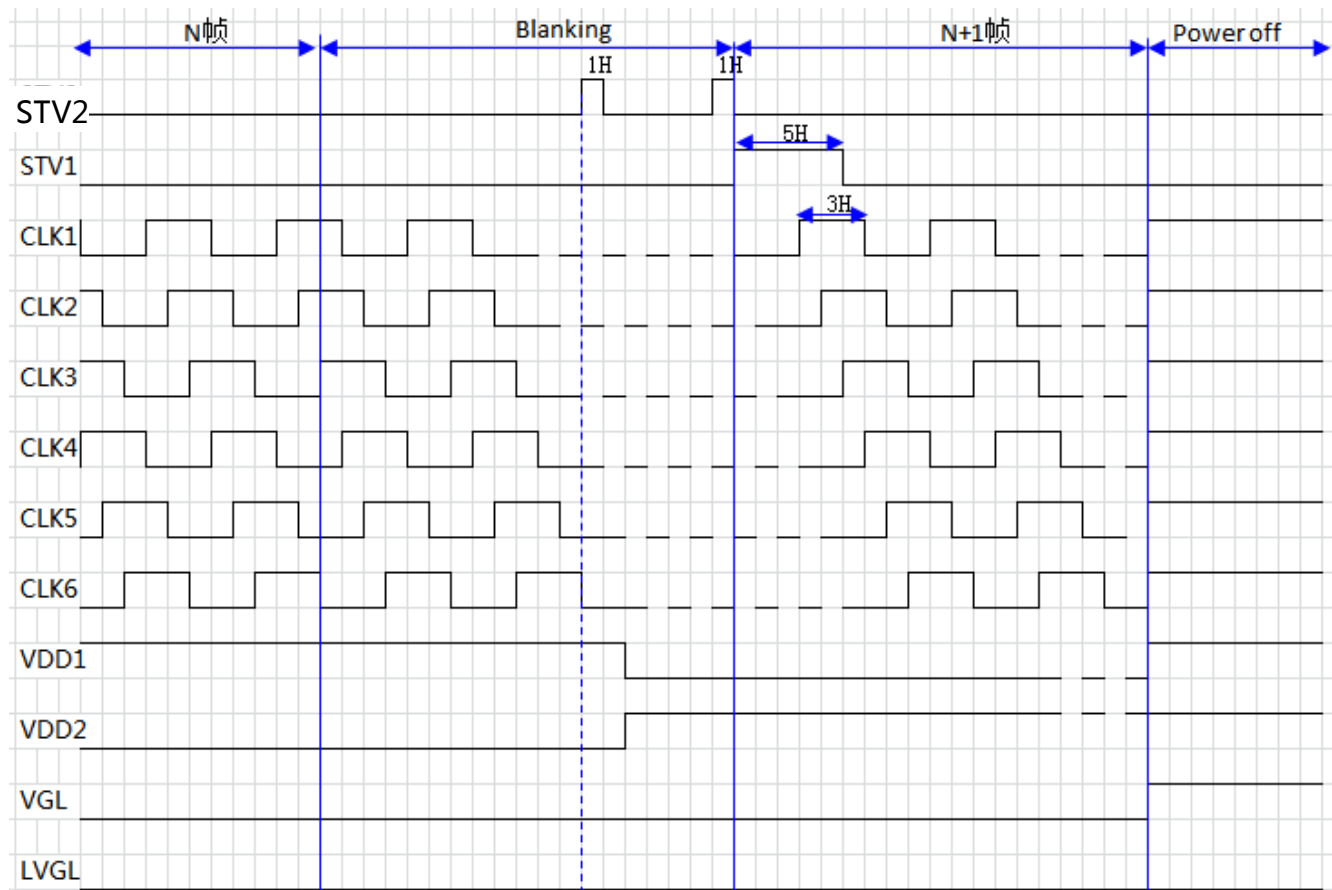
Note:

1. VGH is TFT Gate operating voltage.
2. VGL is TFT Gate operating voltage. The low voltage level of VGL signal must be fluctuates with same phase as Vcom.
3. Vcom must be adjusted to optimize display quality, as Crosstalk and Contrast Ratio etc..

We just kindly recommend the setting-voltages the reference value.

In order to get the optimized display quality, the setting-voltage should be changed according to customer' s developing condition. (The display quality could be changed by customer' s setting -voltage.)

3.2 GOA Timing



时序说明：

1. CLK高电平3H，占空比为50%
2. STV0为双脉冲，高电平1H，分别于Dummy CLK后 & STV1 前（均为Blank区内）触发；
3. VDD0与VDDE为互反信号，高低电平切换时间~2s，STV0双脉冲之间（Blank区内）切换；
4. 关机时VGL & VDD & CLK置高，其余不置高；
5. 所有方波信号高电平VGH=33V，低电平LVGL -3~-10V；
6. 直流信号VGH=33V，低电平LVGL -3~-10V；VGL -3~-10V；

4.0 OPTICAL SPECIFICATION

4.1 Overview

The test of Optical specifications shall be measured in a dark room (ambient luminance ≤ 1 lux and temperature = $25 \pm 2^\circ\text{C}$) with the equipment of Luminance meter system (Goniometer system and TOPCON BM-5) and test unit shall be located at an approximate distance 50cm from the LCD surface at a viewing angle of θ and Φ equal to 0° . The center of the measuring spot on the Display surface shall stay fixed.

The backlight should be operating for 30 minutes prior to measurement.

4.2 Optical Specifications

<Table 4. Optical Specifications >

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
Viewing Angle Range	Horizontal	$\Theta 3$	CR > 10	70	85	-	Deg.	Note1
		$\Theta 9$		70	85	-	Deg.	
	Vertical	$\Theta 12$		70	85	-	Deg.	
		$\Theta 6$		70	85	-	Deg.	
Contrast ratio		CR	$\Theta = 0^\circ$	700	1000	-		Note2
Transmittance		Tr		3.6	4.0		%	Note3
Color Gamut		CG		64	68		%	
Reproduction of color	Red	Rx	$\Theta = 0^\circ$	0.621	0.651	0.681		Note4 (Based on C Light)
		Ry		0.300	0.330	0.360		
	Green	Gx		0.256	0.286	0.316		
		Gy		0.562	0.592	0.622		
	Blue	Bx		0.108	0.138	0.168		
		By		0.076	0.106	0.136		

Parameter	Symbol	Condition	Min.	Typ.	Max.	Unit	Remark
White Chromaticity	W _x	Θ = 0°	0.277	0.307	0.337		Note4 (Based on C Light)
	W _y		0.304	0.334	0.364		
Response Time (GTG)	T _g	Ta= 25° C Θ = 0°		15	25	ms	Note 5

Note:

1.Viewing angle is the angle at which the contrast ratio is greater than 10. The viewing angles are determined for the horizontal or 3, 9 o' clock direction and the vertical or 6, 12 o' clock direction with respect to the optical axis which is normal to the LCD surface (see FIGURE 1).

2.Contrast measurements shall be made at viewing angle of Θ= 0 and at the center of the LCD surface. Luminance shall be measured with all pixels in the view field set first to white, then to the dark (black) state . (see FIGUR 1)
Luminance Contrast Ratio (CR) is defined mathematically.

$$CR = \frac{\text{Luminance when displaying a white raster}}{\text{Luminance when displaying a black raster}}$$

3.Transmittance is the Value without APF and without CG.

4.The color chromaticity coordinates specified in the above table shall be calculated from the spectral data measured with all pixels first in red, green, blue and white. Measurements shall be made at the center of the panel.

5.Response time T_g is the average time required for display transition by switching the input signal as below table and is based on Frame rate fV =60Hz to optimize. Each time in below table is defined as Figure 2 and shall be measured by switching the input signal for "any level of gray(bright)" and "any level of gray(dark)"

Figure1 Measurement Set Up

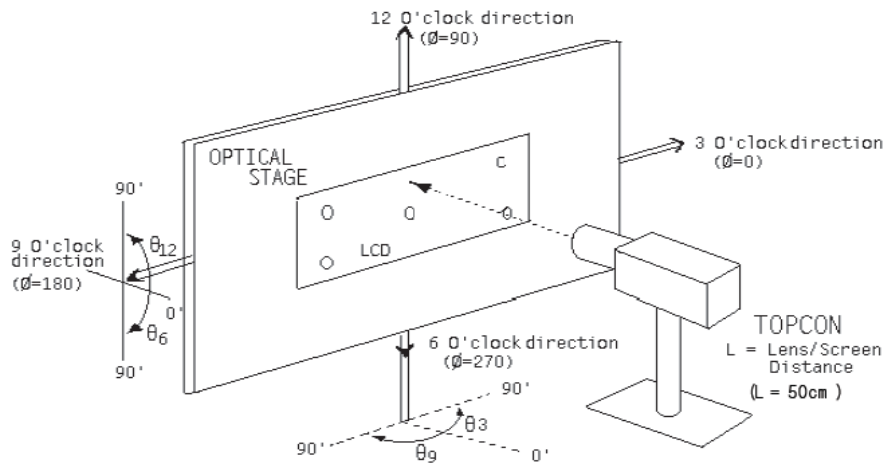


Figure2 Response Time Testing

Measured Response Time	Target																
	0	15	31	47	63	79	95	111	127	143	159	175	191	207	223	239	255
0																	
15																	
31																	
47																	
63																	
79																	
95																	
111																	
127																	
143																	
159																	
175																	
191																	
207																	
223																	
239																	
255																	

5.0 Reliability Test

The Reliability test items and its conditions are shown in below.

<Table 5. Reliability Test Parameters >

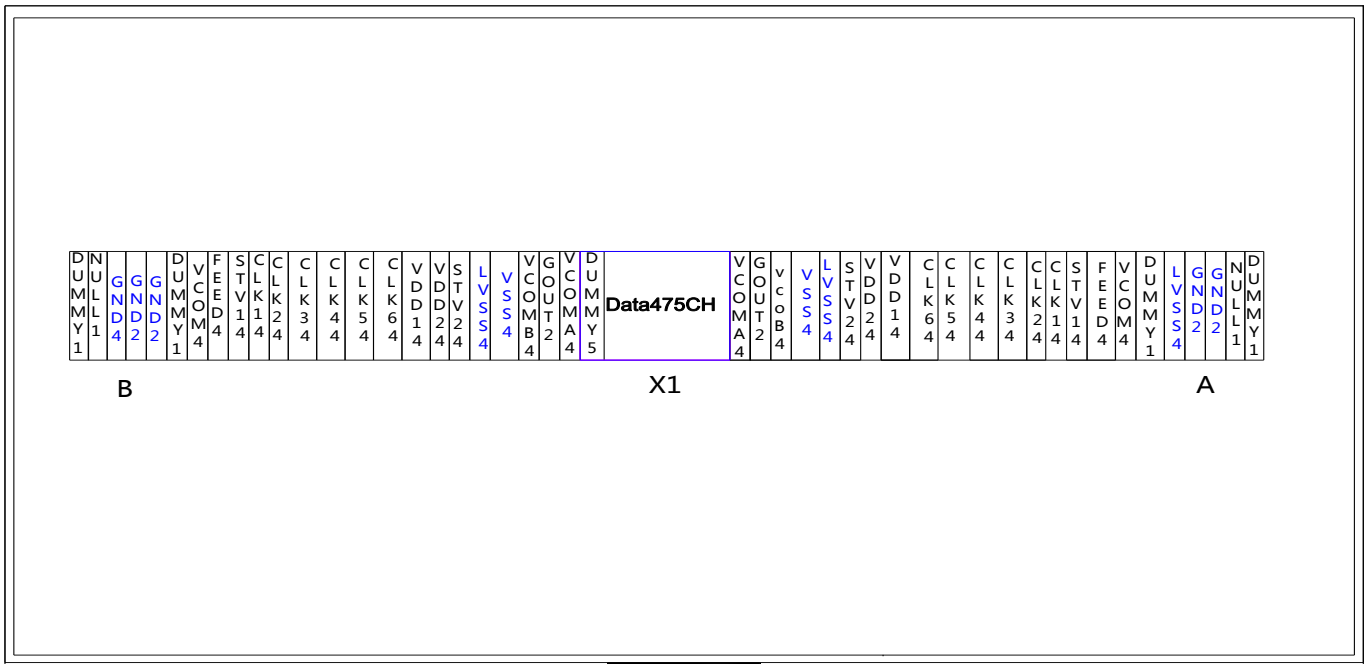
No	Test Items	Conditions
1	High temperature storage test	Ta = 60 °C, 240 hrs
2	Low temperature storage test	Ta = -20°C, 240 hrs
3	High temperature & high humidity (operation test)	Ta = 50 °C, 80%RH, 240hrs
4	Low temperature operation test	Ta = -5 °C, 240hrs
5	High temperature operation test	Ta = 50°C, 240hrs
6	Thermal Shock Test	Ta = -20 °C ↔ 60 °C (0.5 hr), 100 cycle

6.0 Pin Assignment & Mechanical Characteristics

6.1 Dimension Requirements

Mechanical outlines for the panel (H: horizontal length, V: Vertical length)

<Table 6 Dimensional Parameters>



B

X1

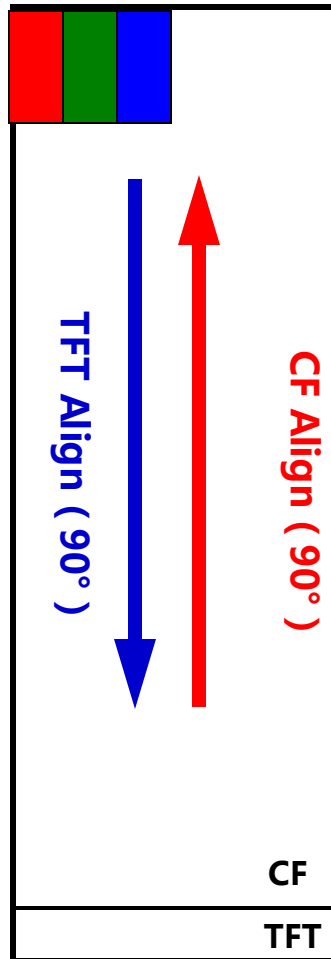
A

B X1 A

Parameter	ITEMS	Unit	Remark
Dimensional Outline	593.82 (H)×56.59 (V)	mm	
Active area	585.216(H)×48.1584(V)	mm	
Sealing Area(mm)	4.2158/4.2158/3.1/3.504	mm	
Number of pixels	158 (H) ×1920 (V)	pixels	
	1pixel=R+G+B dots		
Pixel pitch	0.1016(H) × 0.3048(V)	mm	
Pad Area	2.0	mm	

6.2 LC Align Direction & Pol absorption axis

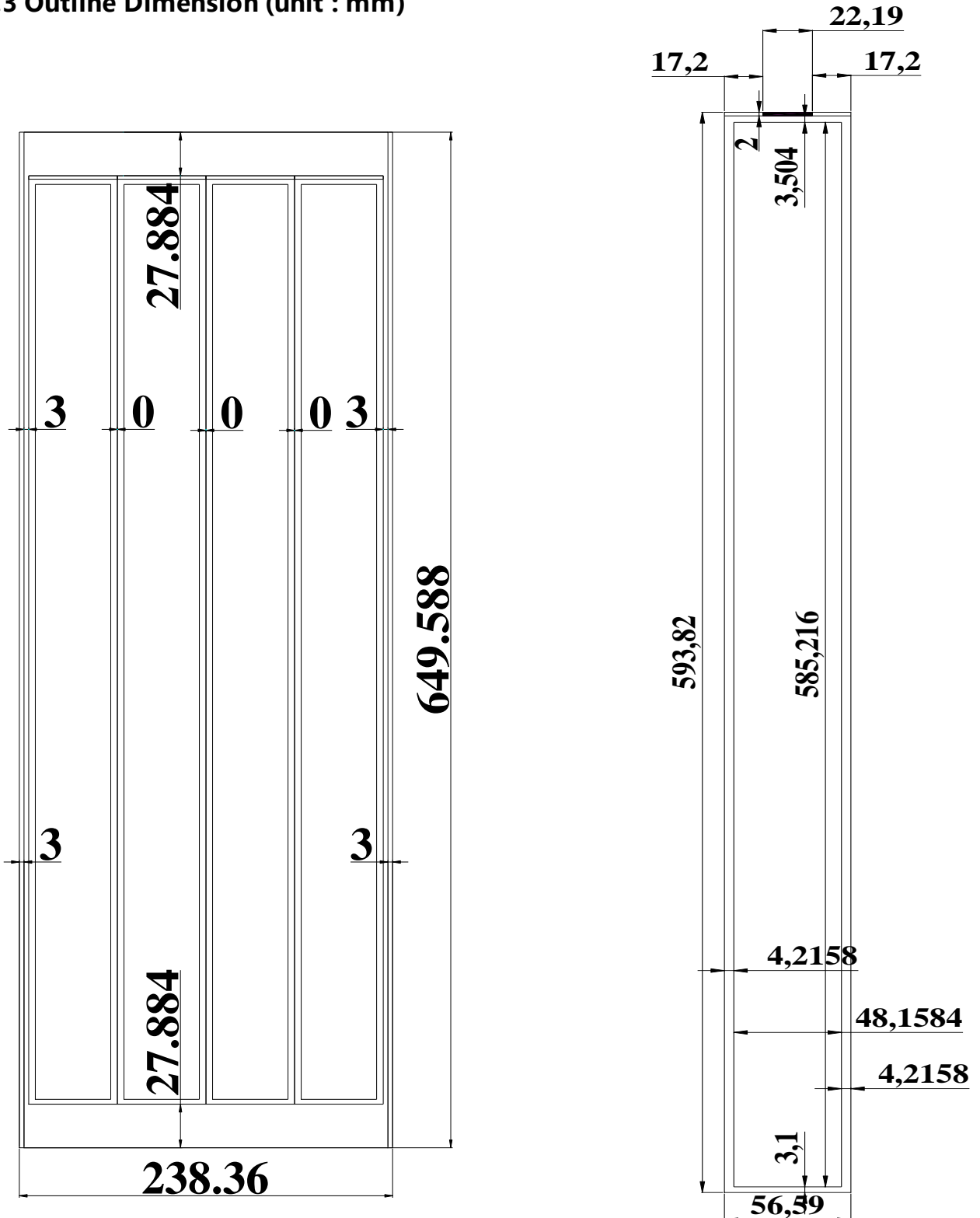
Figure3 The TFT and CF LC Align Direction



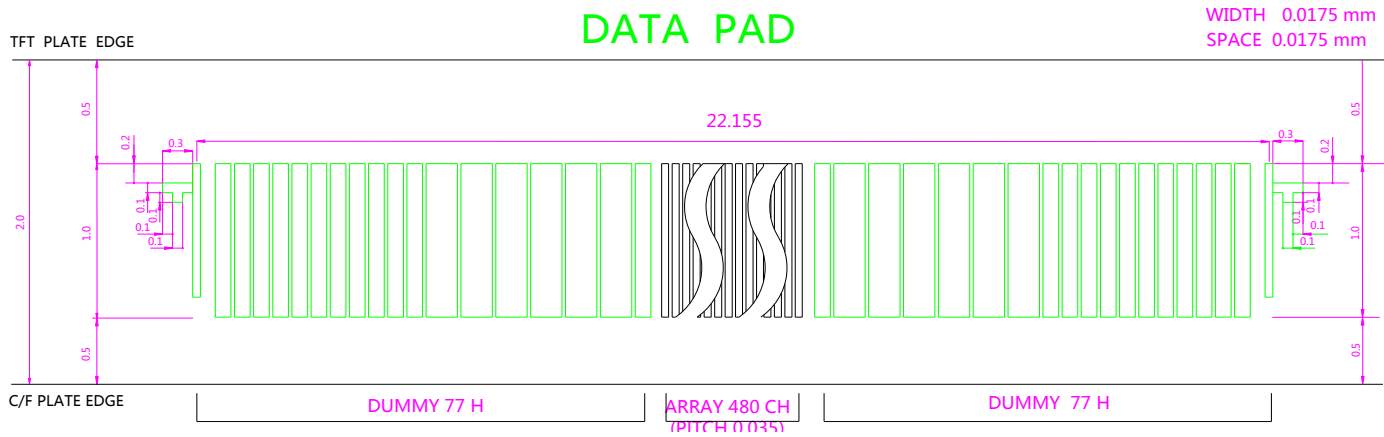
Pol absorption axis

Shown in Figure3, CF pol absorption axis is parallel with CF align direction(90°) ,
TFT pol absorption axis is vertical with TFT align direction (0°)

6.3 Outline Dimension (unit : mm)

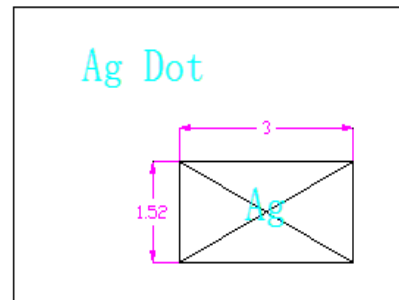
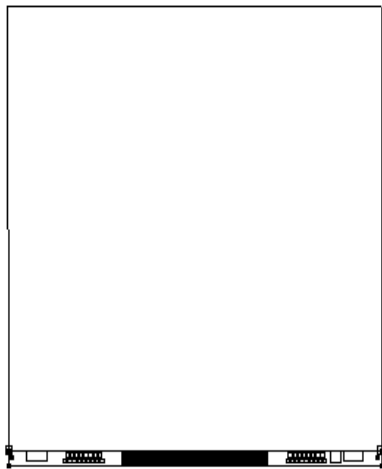
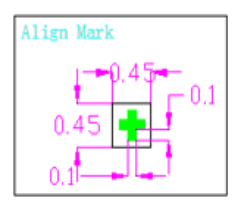
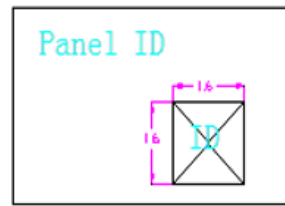
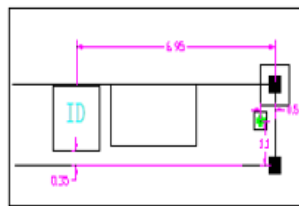
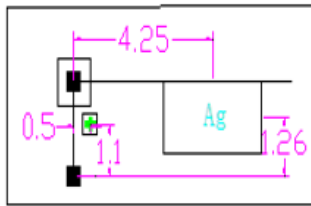


6.4 IC Position Information(unit : mm)



Channel数 : 634ea			Pitch : 35um	
Left Dummy	Signal	Right Dummy	Width (um)	Space (um)
77	480	77	17.5	17.5

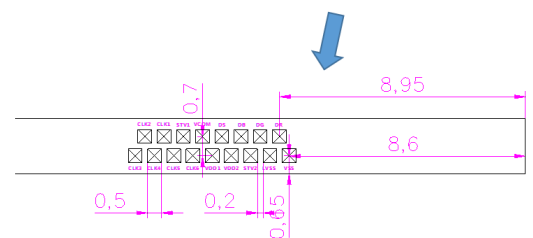
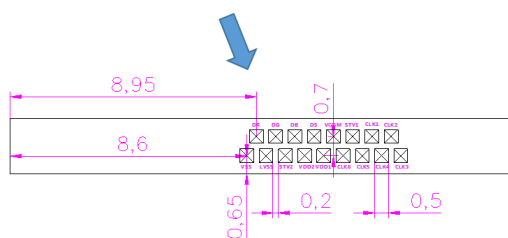
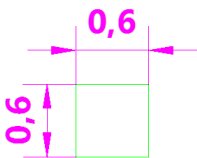
6.5 Panel Alignment Mark & Ag Paste & Cell Test Pad(unit : mm)



ET Test Mode : 3D1C1S+GOA

左侧上 : DR/DG/DB/DS/VCOM/STV1/CLK1/CLK2
左侧下 : VSS/LVSS/STV2/VDD2/VDD1/CLK6/CLK5/CLK4/CLK3

CLK2/CLK1/STV1/VCOM/DS/DB/DG/DR : 右侧上
CLK3/CLK4/CLK5/CLK6/VDD1/VDD2/STV2/LVSS/VSS : 右侧下



7.0 PACKING INFORMATION

7.1 Box Label

- Label Size : 110 mm (L) × 55 mm (W)

- Contents

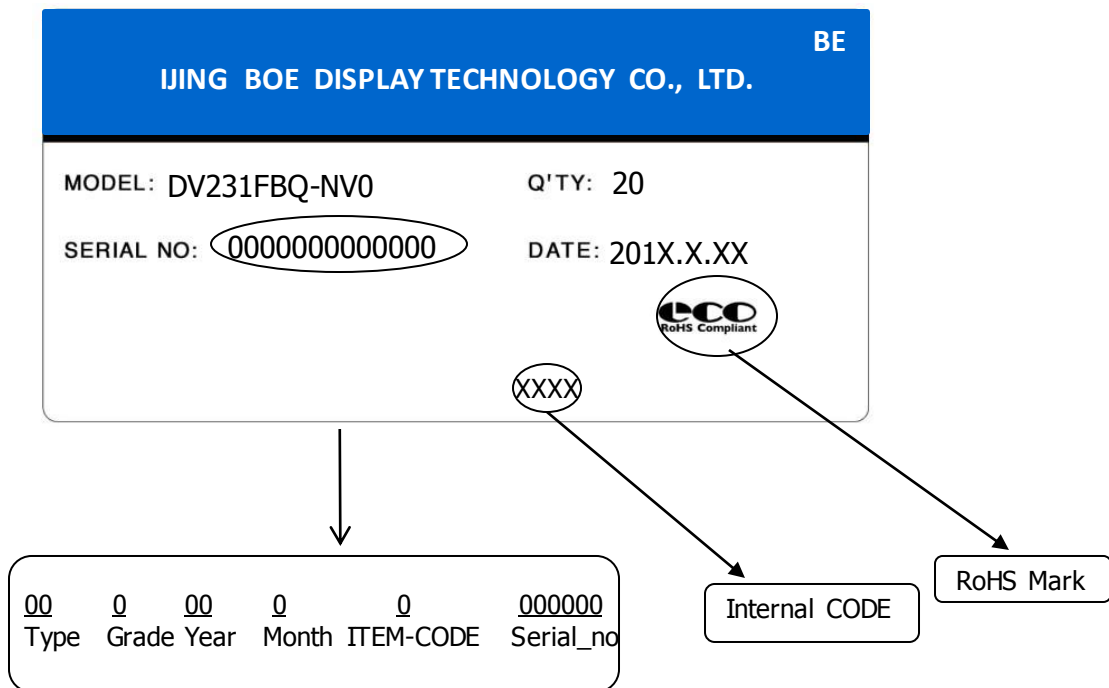
Model : DV231FBQ-NV0

Q`ty : 20Pcs Q-Panel / Box

Serial No. : Box Serial No. See next page for detail description.

Date : Packing Date

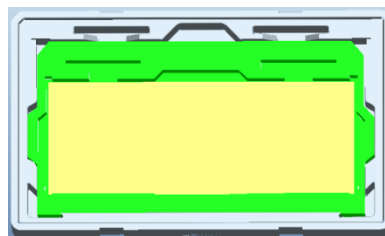
FG Code : FG Code of Product



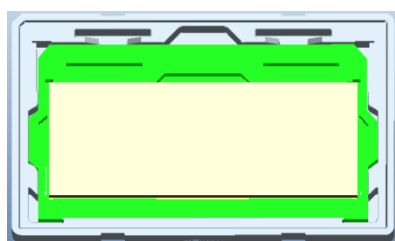
7.2 Packing Spec.



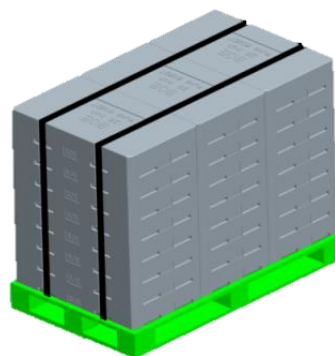
1. Put 1pcs 46t EPE pad in the box ; and then put 1Pcs paper pad in it ,



2. Put one Q-panel on paper pad . then put paper pad and Q-panel ...totally 20Pcs Q-panel and 21Pcs paper pad.



3. Put 1pcs 36t EPE PAD ,put in 2ea Driers . one Box is OK



4. Put one paper pad on the pallet, Put totally 8boxes and 1cover, (24ea boxes per pallet).

10.1 Packing Note

- Box Dimension : 806mmL× 472mmW× 124mmH
- Package Quantity in one Box : 20pcs Q-Panel/EPS Box;

8.0 PRECAUTIONS

Please pay attention to the followings when you use this TFT LCD Panel.

8.1 Mounting Precautions

- You should consider the mounting structure so that uneven force (ex. Twisted stress, Concentrated stress) is not applied to the Panel. And the case on which a Panel is mounted should have sufficient strength so that external force is not transmitted directly to the Panel.
- Do not apply mechanical stress or static pressure on Panel; Abnormal display cause by pressing some parts of Panel during assembly process, do not belong to product failure, the press should be agreed by two sides.
- Determine the optimum mounting angle, refer to the viewing angle range in the specification for each model.
- Do not apply mechanical stress or static pressure on Panel, and avoid impact, vibration and falling.
- Acetic acid type and chlorine type materials for the cover case are not desirable because the former generates corrosive gas of attacking the panel at high temperature and the latter causes circuit break by electro-chemical reaction.
- You should adopt radiation structure to satisfy the temperature specification.
- The ITO pad area needs special careful caution because it could be easily corroded.
- Do not contact the ITO pad area with HCFC, Soldering flux, Chlorine, Sulfur, saliva or fingerprint. To prevent the ITO corrosion, customers are recommended that the ITO area would be covered by UV or silicon.

8.2 Operating Precautions

- The electrochemical reaction caused by DC voltage will lead to LCD Panel degradation, so DC drive should be avoided.
- Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Panel may be damaged.
- Be careful for condensation at sudden temperature change. Condensation makes damage to panel or electrical contacted parts. And after fading condensation, smear or spot will occur.

8.3 Electrostatic Discharge Precautions

- Avoid the use work clothing made of synthetic fibers. We recommend cotton clothing or other conductivity-treated fibers.
- Since a Panel is composed of electronic circuits, it is not strong to electrostatic discharge. Make certain that treatment persons are connected to ground through wrist band etc.
- Do not close to static electricity to avoid product damage.

8.4 Precautions for Strong Light Exposure

- Do not leave the Panel operation or storage in Strong light . Strong light exposure causes degradation of color filter.

8.5 Precautions for Storage

A. Atmosphere Requirement

ITEM	UNIT	MIN	MAX
Storage Temperature	(°C)	5	40
Storage Humidity	(%rH)	40	75
Storage Life	6 months		
Storage Condition	<ul style="list-style-type: none"> • The storage room should be equipped with a dark and good ventilation facility. • Prevent products from being exposed to the direct sunlight, moisture and water. • The product need to keep away from organic solvent and corrosive gas. • Be careful for condensation at sudden temperature change. • Storage condition is guaranteed under packing conditions. 		

B. Package Requirement

- The product should be placed in a sealed polythene bag.
- Product Should be placed on the pallet, Which is away from the floor, Be cautions not to pile the product up.
- The panel surface should not come in contact with any other object. It is recommended that they are stored in the container in which they were shipped.

8.6 Appropriate Condition for Display

-Generally LCD Panels are designed for consumer applications . Accordingly, long-term display in application, can cause uneven display including image sticking. To optimize Panel's lifetime and function, several operating usages are required.

1. Normal operating condition

- Temperature: $20 \pm 15^{\circ}\text{C}$
- Operating Ambient Humidity : $55 \pm 20\%$
- Display pattern: dynamic pattern (Real display)
- Well-ventilated place is recommended to set up display system

2. Special operating condition

a. Ambient condition

- Well-ventilated place is recommended to set up display system.

b. Power and screen save

- Periodical power-off or screen save is needed after long-term display.

c. As the low temperature, the response time is greatly delayed. As the high temperatures (higher than the operating temperature) the LCD Panel may turn black screen. The above phenomenon cannot explain the failure of the display. When the temperature returns to the normal operating temperature, the LCD Panel will return to normal display.

d. When expose to drastic fluctuation of temperature (hot to cold or cold to hot) ,the LCD Panel

may be affected; Specifically, drastic temperature fluctuation from cold to hot ,produces dew on the LCD Panel 's surface which may affect the operation of the LCD Panel

e. Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on) Otherwise the Panel may be damaged.

f. Product reliability and functions are only guaranteed when the product is used under right operation usages. If product will be used in extreme conditions such as high temperature, high humidity, high altitude, special display images, running time, long time operation, outdoor operation, etc. It is strongly recommended to contact BOE for filed application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at airports, transit stations, banks, stock market and controlling systems.

3. Operating usages to protect against image sticking due to long-term static display.

a. Suitable operating time: under 20 hours a day.

b. Static information display recommended to use with moving image.

- Cycling display between 5 minutes' information(static) display and 10 seconds' moving image.

c. Background and character (image) color change

- Use different colors for background and character, respectively.

- Change colors themselves periodically.

d. Avoid combination of background and character with large different luminance.

1) Abnormal condition just means conditions except normal condition.

2) Black image or moving image is strongly recommended as a screen save

8.7 Other Precautions

A. LC Leak

- If the liquid crystal material leaks from the panel, it is recommended to wash the LC with acetone or ethanol and then burn it.
- 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, skin or clothes, it has to be washed away thoroughly with soap.
- If LC in mouth, mouth need to be washed, drink plenty of water to induce vomiting and follow medical advice.
- If LC touch eyes, eyes need to be washed with running water at least 15 minutes.

B. Rework

- When returning the Panel for repair or etc., Please pack the Panel not to be broken. We recommend to use the original shipping packages.