

DLC Display Co., Limited

德爾西顯示器有限公司



MODEL No: DLC0350SZR-1

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Record of Revision

Date	Revision No.	Summary
2016-07-18	1.0	Rev 1.0 was issued

1. Scope

This data sheet is to introduce the specification of DLC0350SZR-1 active matrix TFT module. It is composed of a color TFT-LCD panel, driver IC, FPC and a backlight unit. The 3.5" display area contains 480xRGBx640 pixels.

2. Application

Digital equipments which need color display, mobile phone, mobile navigator/video systems.

3. General Information

Item	Contents	Unit
Size	3.5	inch
Resolution	480xRGBx640	/
Interface	RGB	/
Technology type	α -Si TFT	/
Dot Pitch (W x H)	0.0372 x 0.1116	mm
Pixel Configuration	RGB vertical stripe	
Outline Dimension (W x H x D)	63.60 x 84.60 x 2.90	mm
Active Area (H x V)	53.57 x 71.42	mm
Display Mode	Transflective, Normally Black	/
Viewing Direction	All	
Backlight Type	LED	/
Driver IC	HX8363A	/

4. Outline Drawing

PIN	FUNCTION	SYMBOL
1	GND	
2	YU	
3	XR	
4	YD	
5	XL	
6	GND	
7	NC	
8	NC	
9	GND	
10	NC	
11	NC	
12	NC	
13	NC	
14	NC	
15	GND	
16	NC	
17	XREFS	
18	NC	
19	NC	
20	VCC	
21	GND	
22	B0	
23	B1	
24	B2	
25	B3	
26	B4	
27	B5	
28	GND	
29	G0	
30	G1	
31	G2	
32	G3	
33	G4	
34	G5	
35	GND	
36	R0	
37	R1	
38	R2	
39	R3	
40	R4	
41	GND	
42	VDDO	
43	NC	
44	GND	
45	GND	
46	CLK	
47	GND	
48	DE	
49	DOUT	
50	XCS	
51	DIN	
52	NC	
53	SOL	
54	VS7NC	
55	HS7NC	
56	NC	
57	NC	
58	LED-	
59	LED+	
60	GND	

LED CIRCUIT DIAGRAM:

6EA If=20mA

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DRAWN BY:	BY:	TITLE: DLC0350SZR-1	
CHECKED BY:	BY:	DWG NO: V0	SCALE:
APPROVED BY:	BY:	DWG NAME:	UNIT: mm
CONFIRMED BY:	BY:		SHEET NO: OF

NOTES:

- DISPLAY TYPE: 3.5" TFT, NORMALLY BLACK
- VIEWING DIRECTION : U/L/D/R 80/80/80/80
- Driver IC : HX8363A
- Top : -10° C ~ 60° C, Tst : -20° C ~ 70° C
- GENERAL TOLERANCE: ±0.2

5. Interface signals

No.	Symbol	Function
1	GND	Ground
2	YU	RTP pin, No connection
3	XR	
4	YD	
5	XL	
6	GND	Ground
7~8	NC	No Connection
9	GND	Ground
10~14	NC	No Connection
15	GND	Ground
16	NC	No Connection
17	XRES	Reset pin
18~19	NC	No Connection
20	VDC	Power supply for the analog power
21	GND	Ground
22~27	B0~B5	Data Bus
28	GND	Ground
29~34	G0~G5	Data Bus
35	GND	Ground
36~41	R0~R5	Data Bus
42	GND	Ground
43	VDDIO	Power supply for the logic power
44	NC	Not Connected
45	GND	Ground
46	PCLK	Dot clock signal
47	GND	Ground
48	DE	Display enable signal for RGB interface operation
49	DOUT	Data output pin in serial mode
50	XCS	Chip select signal
51	DIN	Data input pin in serial mod
52	NC	No Connection
53	SCL	Clock input pin in serial mode
54	VSYNC	Frame synchronization signal
55	HSYNC	Line synchronization signal
56~57	NC	No Connection
58	LED-	Power supply for backlight cathode input terminal
59	LED+	Power supply for backlight anode input terminal
60	GND	Ground

6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

Item	Symbol	Min.	Max.	Unit	Remark
Supply Voltage	VCC	-0.3	4.6	V	

6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-10	60	°C	
Storage Temperature	TSTG	-20	70	°C	
Storage Humidity	HD	20	90	%RH	

6.3. LED Backlight Absolute max. ratings

Item	Symbol	Min.	Max.	Unit	Remark
LED Forward Current	ILED	--	25	mA	One LED
LED forward voltage	VLED		3.5	V	

7. Electrical Specifications

7.1 Electrical characteristics

GND=0V, Ta=25°C

Item	Symbol	Min.	Typ.	Max.	Unit	Remark
Supply Voltage	VCC	2.3	-	3.3	V	
Logic Low input voltage	V _{IL}	GND	-	0.3*VCC	V	Digital input pins
Logic High input voltage	V _{IH}	0.7*VCC	-	VCC	V	Digital input pins
Logic Low output voltage	V _{OL}	GND	-	0.2*VCC	V	I _{OH} =-0.1mA
Logic High output voltage	V _{OH}	0.8*VCC	-	VCC	V	I _{OH} =-0.1mA
I/O Leak Current	I _{LI}	-1	-	1	μA	

7.2 LED Backlight

Ta=25°C

Item	Symbol	Min	Typ	Max	Unit	Remark
Forward Voltage	V _F	18.0	19.2	21	V	I _F =20mA/LED
Forward Current	I _F	-	20	-	mA	V _F =3.2V/LED
Life time	-	-	30,000	-	Hr	

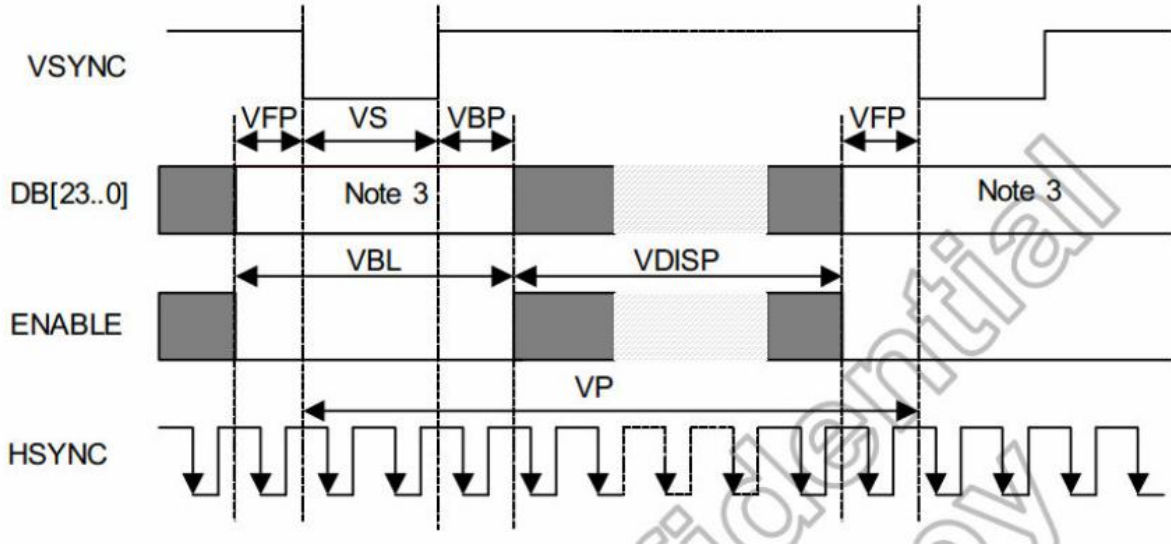
Backlight circuit:



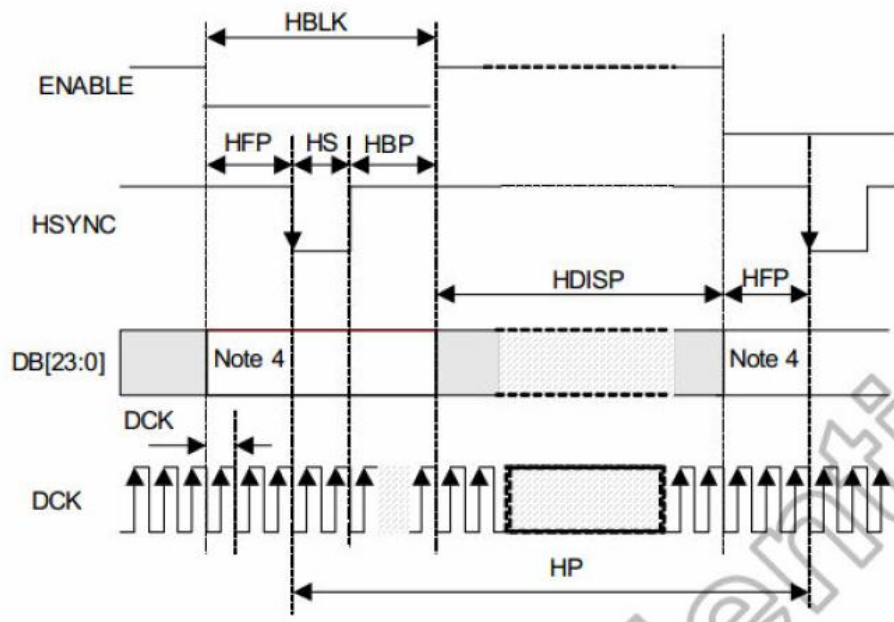
8. Timing Characteristics

8.1 RGB interface Characteristics

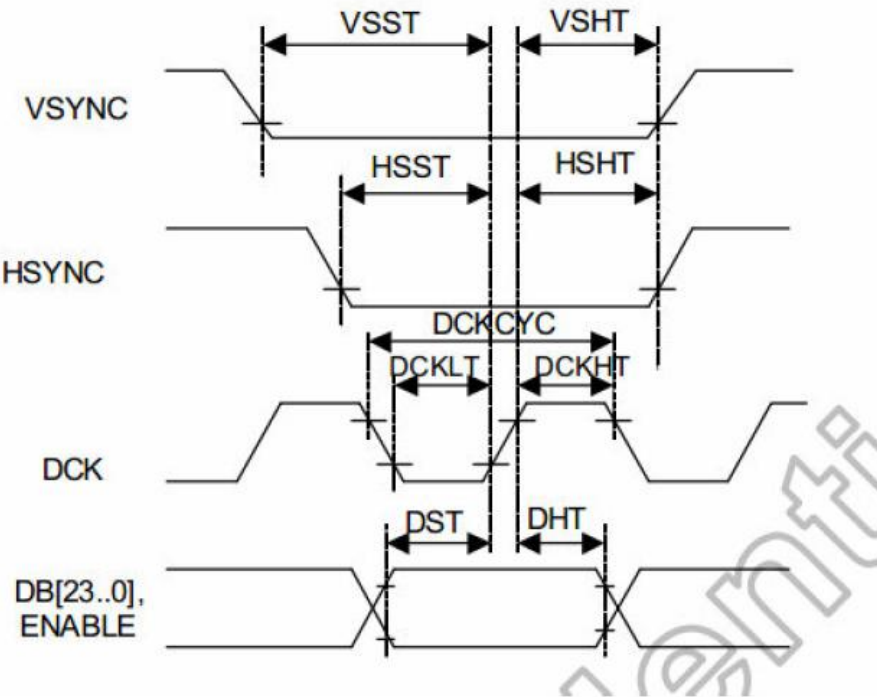
Vertical Timings for RGB I/F



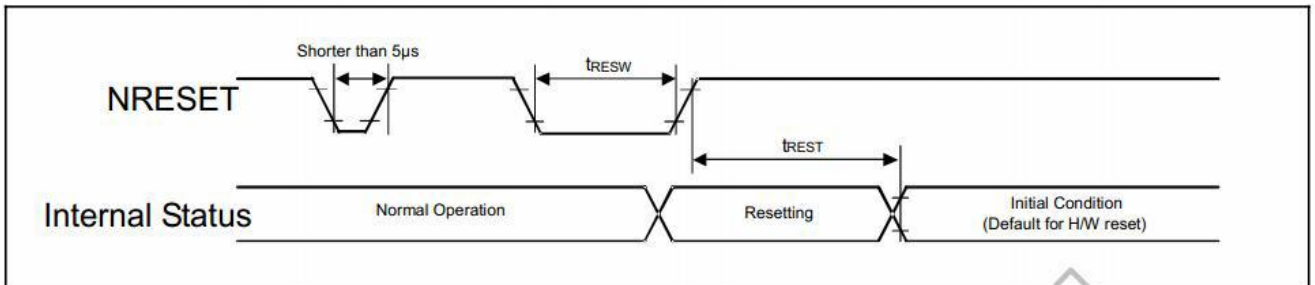
Horizontal Timings for RGB I/F



General Timings for RGB I/F



8.2 Reset Timing Characteristics



Symbol	Parameter	Related pins	Min.	Typ.	Max.	Note	Unit
t_{RESW}	Reset low pulse width ⁽¹⁾	NRESET	10	-	-	-	µs
t_{REST}	Reset complete time ⁽²⁾	-	5	-	-	When reset is applied during Sleep In mode	ms
		-	120	-	-	When reset is applied during Sleep Out mode	ms

9. Optical Specification

9.1 Transmissive mode

Item		Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio		CR	$\theta=0^\circ$	-	250	-	-	Note2 Note3
Response Time		Tr + Tf	25°C	-	30	50	ms	Note2 Note4
View Angles		θT	$CR \geq 10$	60	80	-	Degree	Note 5
		θB		60	80	-		
		θL		60	80	-		
		θR		60	80	-		
Chromaticity	White	x	Brightness is on	-	0.314	-	-	Note6, Note2
		y		0.346				
	Red	x		0.623	0.643	0.663		
		y		0.313	0.333	0.353		
	Green	x		0.284	0.304	0.324		
		y		0.558	0.578	0.598		
	Blue	x		0.121	0.141	0.161		
		y		0.117	0.137	0.157		
NTSC		S		-	60	-	%	Note6
Luminance		L		-	120	-	cd/m ²	Note2 Note7
Transmittance Ratio (With Polarizer)		R	$\theta = \phi = 0^\circ$	-	2	-	%	

9.2 Reflective mode (without the backlight)

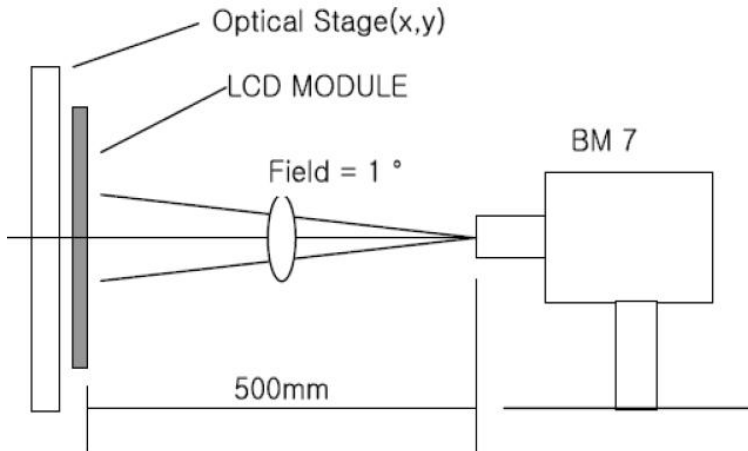
Item		Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Reflection Ratio (With Polarizer)		R	$(\theta = \phi = 0^\circ)$	-	7	-	%	
Reflective Contrast Ratio		CR	$\theta=0^\circ$	-	15	-		
View Angles		θT	$CR \geq 2$	-	45	-	Degree	Note1
		θB		-	45	-		
		θL		-	45	-		
		θR		-	45	-		

Note 1: The polarizers are SRCG31APN2HC5(Top) and SRCH31APT2(Bottom).

Note 2: Definition of optical measurement system.

Temperature = 25°C(±3°C)

LED back-light: ON, Environment brightness < 150 lx

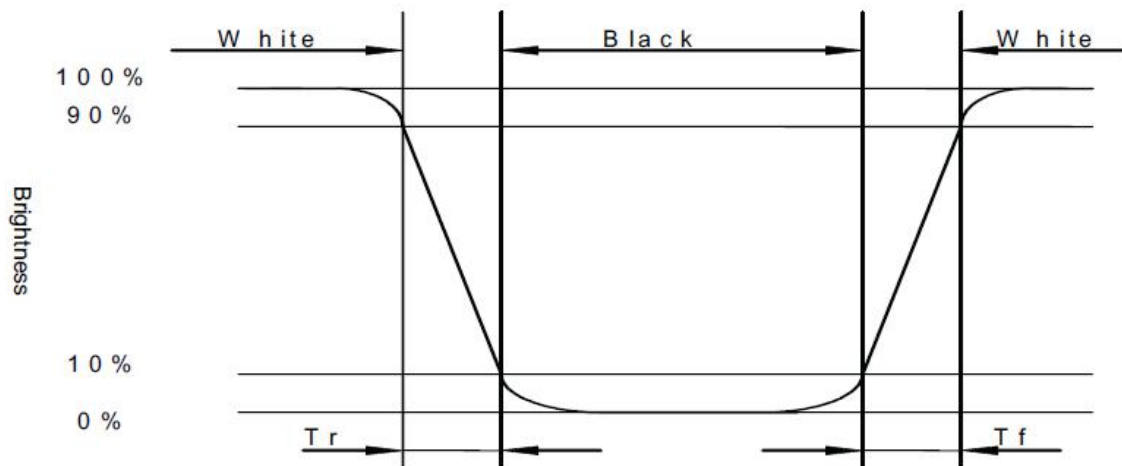


Note 3: Contrast ratio is defined as follow:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$

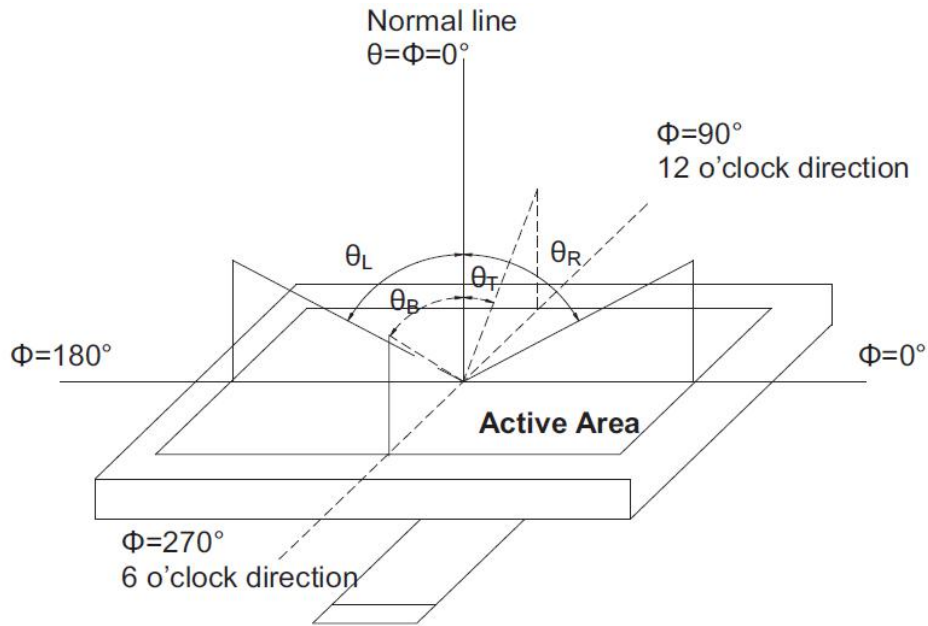
Note 4: Response time is defined as follow:

Response time is the time required for the display to transition from black to white (Rise Time, Tr) and from white to black (Decay Time, Tf).



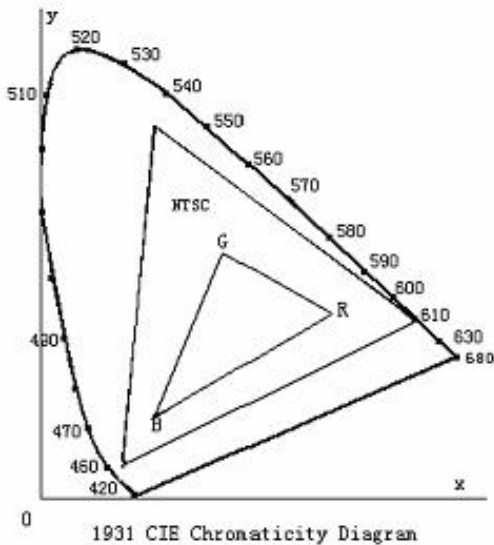
Note 5: Viewing angle range is defined as follow:

Viewing angle is measured at the center point of the LCD.



Note 6: Color chromaticity is defined as follow: (CIE1931)

Color coordinates measured at center point of LCD.



$$S = \frac{\text{area of RGB triangle}}{\text{area of NTSC triangle}} \times 100\%$$

Note 7: Luminance is defined as follow:

Luminance is defined as the brightness of all pixels “White” at the center of display area on optimum contrast.

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+60°C, 120hrs	Per table in below
2	Low Temp Operation	Ta=-10°C, 120hrs	Per table in below
3	High Temp Storage	Ta=+70°C, 120hrs	Per table in below
4	Low Temp Storage	Ta=-20°C, 120hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+60°C, 90% RH 120 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30°C 30 min~+80°C 30 min, Change time:5min, 100 Cycles	Per table in below
7	ESD (Operation)	Voltage±8KV R:330Ω,C:150PF, Air Mode,10times	Per table in below
8	Vibration (Non-operation)	Frequency:10Hz~55Hz~10Hz Amplitude:1.5M X,Y,Z direction for total 3hours (Packing Condition)	Per table in below
9	Package Drop Test	Height:100 cm, 1 corner, 3 edges, 6 surfaces	Per table in below

INSPECTION	CRITERION(after test)
Appearance	No Crack on the FPC, on the LCD Panel
Alignment of LCD Panel	No Bubbles in the LCD Panel No other Defects of Alignment in Active area
Electrical current	Within device specifications
Function / Display	No Broken Circuit, No Short Circuit or No Black line No Other Defects of Display

11. Precautions for Use of LCD Modules

11.1 Safety

The liquid crystal in the LCD is poisonous. Do not put it in your mouth. If the liquid crystal touches your skin or clothes, wash it off immediately using soap and water.

11.2 Handling

A. The LCD and touch panel is made of plate glass. Do not subject the panel to mechanical shock or to excessive force on its surface.

B. Do not handle the product by holding the flexible pattern portion in order to assure the reliability

C. Transparency is an important factor for the touch panel. Please wear clear finger sacks, gloves and mask to protect the touch panel from finger print or stain and also hold the portion outside the view area when handling the touch panel.

D. Provide a space so that the panel does not come into contact with other components.

E. To protect the product from external force, put a covering lens (acrylic board or similar board) and keep an appropriate gap between them.

F. Transparent electrodes may be disconnected if the panel is used under environmental conditions where dew condensation occurs.

G. Property of semiconductor devices may be affected when they are exposed to light, possibly resulting in IC malfunctions.

H. To prevent such IC malfunctions, your design and mounting layout shall be done in the way that the IC is not exposed to light in actual use.

11.3 Static Electricity

A. Ground soldering iron tips, tools and testers when they are in operation.

B. Ground your body when handling the products.

C. Power on the LCD module before applying the voltage to the input terminals.

D. Do not apply voltage which exceeds the absolute maximum rating.

E. Store the products in an anti-electrostatic bag or container.

11.4 Storage

A. Store the products in a dark place at $+25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ with low humidity (40% RH to 60% RH). Don't expose to sunlight or fluorescent light.

B. Storage in a clean environment, free from dust, active gas, and solvent.

11.5 Cleaning

A. Do not wipe the touch panel with dry cloth, as it may cause scratch.

B. Wipe off the stain on the product by using soft cloth moistened with ethanol. Do not allow ethanol to get in between the upper film and the bottom glass. It may cause peeling issue or defective operation. Do not use any organic solvent or detergent other than ethanol.

11.6 Cautions for installing and assembling

Bezel edge must be positioned in the area between the Active area and View area. The bezel may press the touch screen and cause activation if the edge touches the active area. A gap of approximately 0.5mm is needed between the bezel and the top electrode. It may cause unexpected activation if the gap is too narrow. There is a tolerance of 0.2 to 0.3mm for the outside dimensions of the touch panel and tail. A gap must be made to absorb the tolerance in the case and connector.

