TFT LCD Module

Product Specification

DT028BTFT

2.8” (240(RGB) x 320 PIXELS) TFT Module

June 1, 2016

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Revision Record

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	-	
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1. Scope

This data sheet is to introduce the specification of DT028BTFT active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 2.8” display area contains 240 (RGB) x 320 pixels.

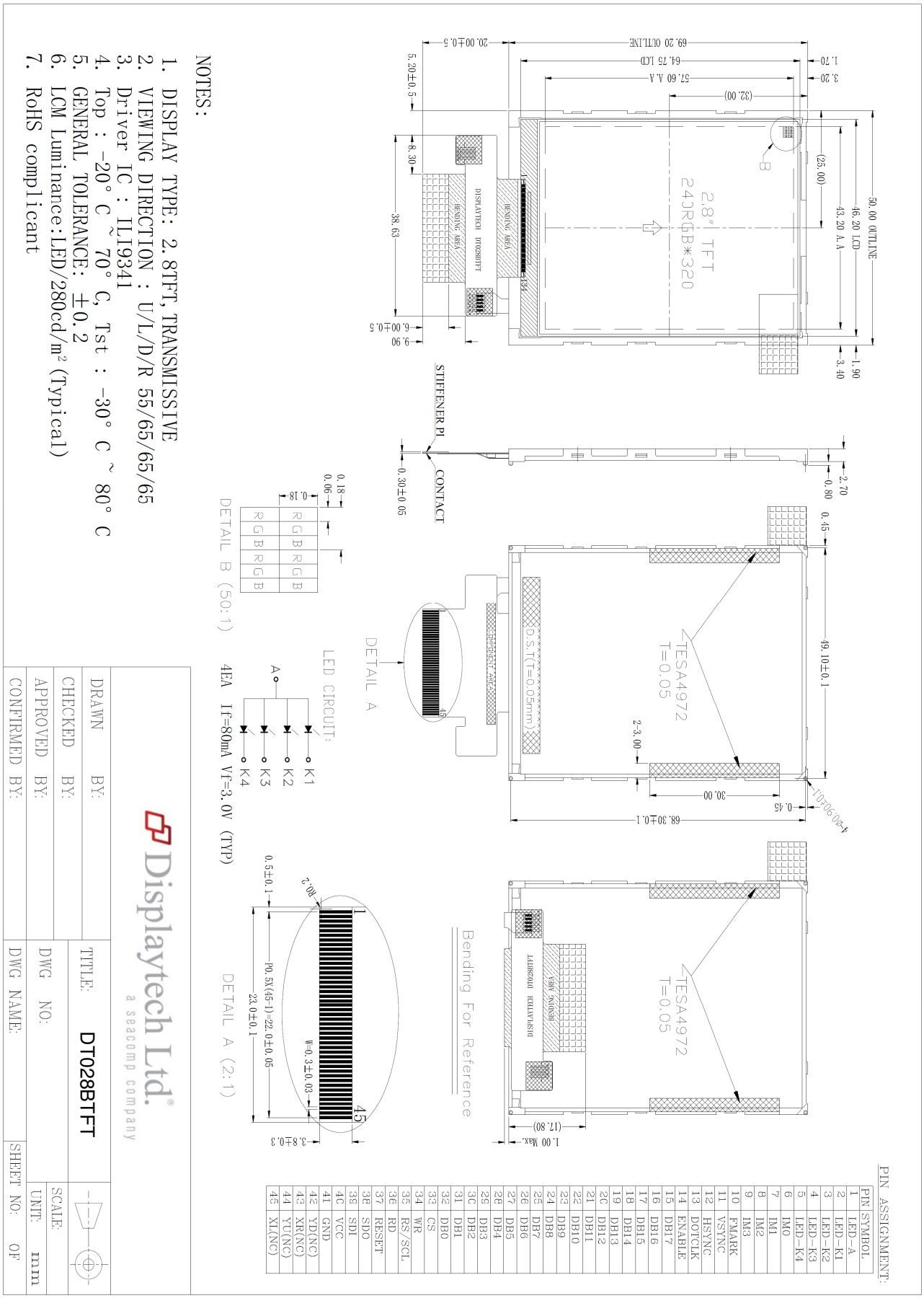
2. Application

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

3. General Information

Item	Contents	Unit
Size	2.8	inch
Resolution	240(RGB) x 320	/
Interface	RGB/MCU	/
Technology Type	a-Si TFT	/
Pixel Configuration	R.G.B. Vertical Stripe	/
Outline Dimension (W x H x D)	50.0 x 69.2 x 2.7	mm
Active Area	43.20 x 57.60	mm
Display Mode	Transmissive	/
Backlight Type	LED	/
Driver IC	ILI9341	/
Weight	TBD	g

4. Outline Drawing



PIN	SYMBOL
1	LED-A
2	LED-K1
3	LED-K2
4	LED-K3
5	LED-K4
6	IM0
7	IM1
8	IM2
9	IM3
10	FMARK
11	VSYNC
12	HSYNC
13	DOTCLK
14	ENABLE
15	DB17
16	DB16
17	DB15
18	DB14
19	DB13
20	DB12
21	DB11
22	DB10
23	DB9
24	DB8
25	DB7
26	DB6
27	DB5
28	DB4
29	DB3
30	DB2
31	DB1
32	DB0
33	CS
34	WR
35	RS/SCL
36	RD
37	RESET
38	SDO
39	SDI
40	VCC
41	GND
42	YD(NC)
43	XR(NC)
44	YU(NC)
45	XL(NC)

5. Interface Signals

No	Symbol	I/O	Description	
1	LED-A	P	LED backlight (Anode)	
2	LED-K1	P	LED backlight (Cathode)	
3	LED-K2	P	LED backlight (Cathode)	
4	LED-K3	P	LED backlight (Cathode)	
5	LED-K4	P	LED backlight (Cathode)	
6	IM0	I	System interface select	
7	IM1	I		
8	IM2	I		
9	IM3	I		
10	FMARK	O	Tearing effect output pin to synchronize MPU to frame writing	
11	VSYNC	I	Frame sync signal	
12	HSYNC	I	Line sync signal	
13	DOTCLK	I	Data clock	
14	DE	I	Data enable pin	
15 ~ 32	DB17 ~ DB0	I	Data bus	
33	CS	I	Chip select signal	
34	WR	I	Write enable pin I80 parallel bus system interface	
35	RS/SCL	I	DNC：Command / parameter or display data selection pin SCL：Serial data clock in serial bus system	
36	RD	I	Read enable pin I80 parallel bus system interface	
37	RESET	I	System reset	
38	SDO	O	Serial data output in serial bus system interface	
39	SDA	I	Serial data Input in serial bus system interface	
40	VDD	P	Power supply	
41	GND	P	Ground	
42	YD (NC)	O	Touch control pin (No connection)	
43	XR (NC)	O		
44	YU (NC)	O		
45	XL (NC)	O		

6. Absolute Maximum Ratings

6.1 Electrical absolute maximum ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Power Supply Voltage	VCC	-0.3	3.6	V	

Notes:

1. If the module is 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. VCC > VSS must be maintained.

6.2 Environment conditions

Parameter	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-20	+70	℃	
Storage Temperature	TSTG	-30	+80	℃	

Note:
1. The response time will become lower when operated at low temperature.
2. Background color changes slightly depending on ambient temperature.
   The phenomenon is reversible.
3. Ta<=40℃:85%RH MAX.
   Ta>=40℃:Absolute humidity must be lower than the humidity of 85%RH at 40℃.

7. Electrical Specifications

7.1 Electrical characteristics

GND=0V, Ta=25℃

Item		Symbol	Condition	MIN	TYP	MAX	Unit	Remark
Power Supply		VCC	Ta=25℃	2.6	2.8	3.3	V	
Input Voltage	H	VIH	VCC=2.8V	0.8VCC	-	VCC	V	
	L	VIL	VCC=2.8V	0	-	0.2VCC	V	
Current Consumption		ICC1	Normal mode	-	8	15	mA	
		ICC2	Sleep mode	-	0.05	0.1	mA	

Note 1: Tested in 1╳1 chessboard pattern.

7.2 LED backlight

Ta=25℃

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward current	IF	-	80	-	mA	
Forward voltage	VF	-	3.0	-	V	
LED life time	-	-	20,000	-	Hr	Note

Note 2: The “LED life time” is defined as the module brightness decrease to 50% original brightness at Ta=25℃ and IL =80mA. The LED lifetime could be decreased if operating IL is larger than 80mA.

8. Optical Specification

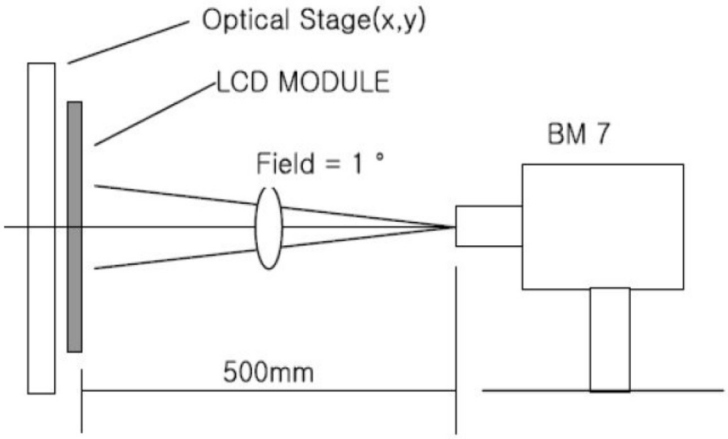
Ta=25°C

Item		Symbol	Condition	MIN	TYP	MAX	Unit	Remark
Contrast ratio		CR	θ=0°	300	500	-		Note 1, 2
Response time		Tr	25°C	-	10	-	ms	Note 1, 3
		Tf		-	10	-		
View angles		ΘT	CR≧10	-	55	-	Degree	Note 4
		ΘB		-	65	-		
		ΘL		-	65	-		
		ΘR		-	65	-		
Chromaticity	White	x	Brightness is on	-	0.28	-		Note 1, 5
		y		-	0.33	-		
	Red	x		-	0.51	-		
		y		-	0.34	-		
	Green	x		-	0.31	-		
		y		-	0.56	-		
	Blue	x		-	0.15	-		
		y		-	0.14	-		
NTSC Ratio		S		50	60		%	Note 1, 5
Luminance		L		200	280	-	cd/m^2	Note 1, 6
Uniformity		U		-	80	-	%	Note 1, 7

Note 1: Definition of optical measurement system.

Temperature = 25℃(±3℃)

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

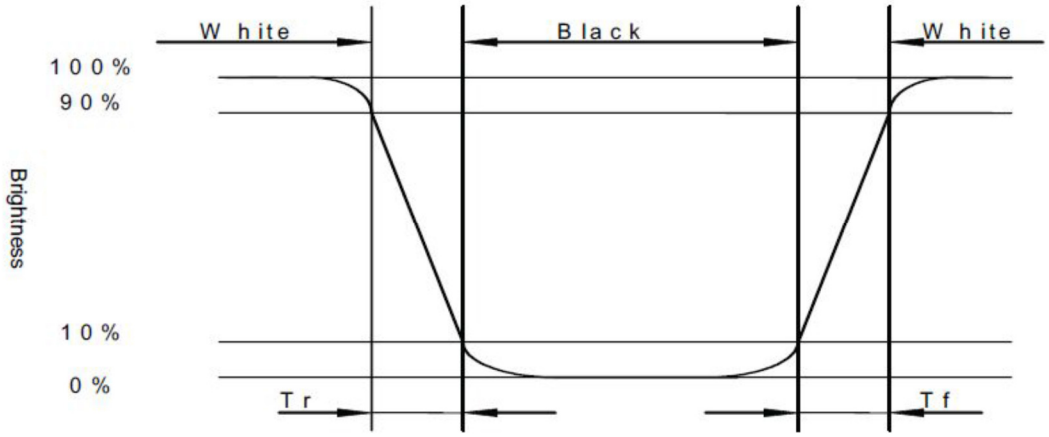


Note 2: Contrast ratio is defined as follow:

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

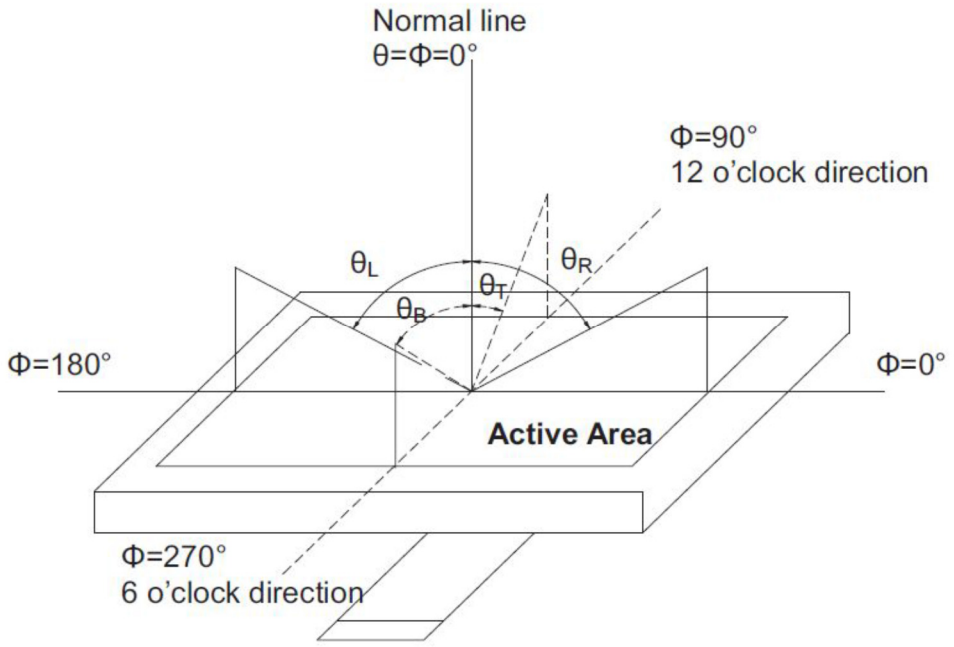
Note 3: Response time is defined as follow:

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).



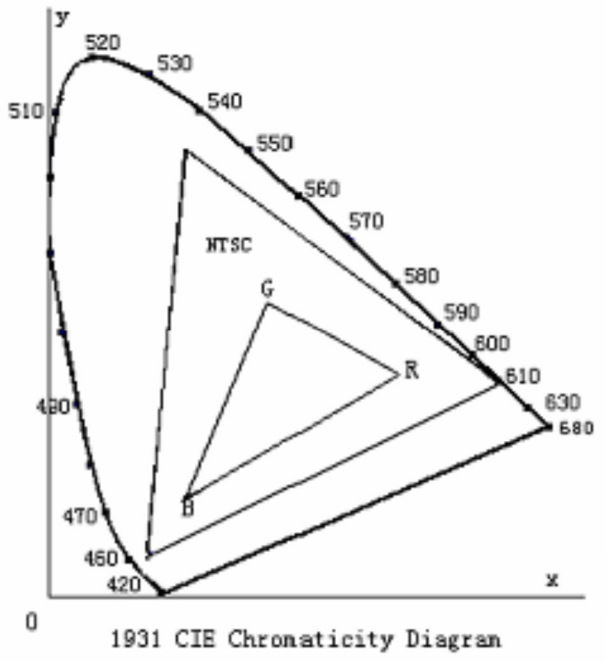
Note 4: Viewing angle range is defined as follow:

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



Note 5: Color chromaticity is defined as follow (CIE1931)

Color coordinates measured at center point of LCD.



1931 CIE Chromaticity Diagram

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

Note 6: Luminance is defined as follow:

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

Note 7: Luminance Uniformity is defined as follow:

Active area is divided into 9 measuring areas (Refer Fig.2). Every measuring point is placed at the center of each measuring area.

$$\text{Uniformity (U)} = \frac{\text{Minimum Luminance(brightness) in 9 points}}{\text{Maximum Luminance(brightness) in 9 points}}$$

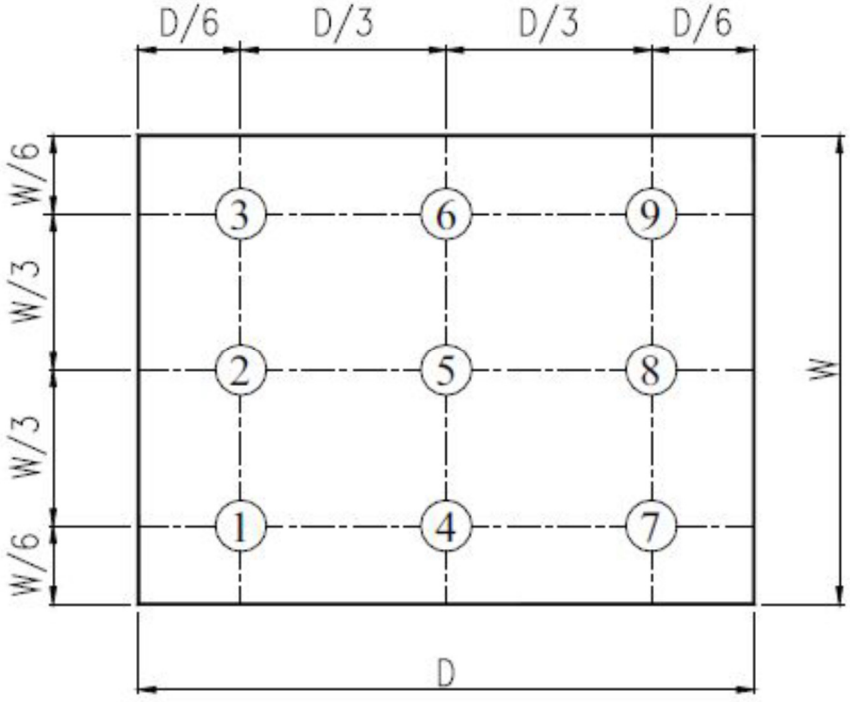


Fig. 2 Definition of uniformity

9. Environmental / Reliability Tests

No	Test Item	Condition	Judgment Criteria
1	High Temp Operation	Ta=+70°C, 96hrs	Per table below
2	Low Temp Operation	Ta=-20°C, 96hrs	Per table below
3	High Temp Storage	Ta=+80°C, 96hrs	Per table below
4	Low Temp Storage	Ta=-30°C, 96hrs	Per table below
5	High Temp & High Humidity Storage	Ta=+60°C, 90% RH, 96hrs	Per table below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30℃ 30 min~+80℃ 30 min, Change time:5min, 5 Cycles	Per table below
7	ESD (Operation)	C=150pF, R=330Ω, 5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times;	Per table below
8	Vibration (Non-operation)	10Hz~150Hz, 100m/s^2, 120min	Per table below
9	Shock (Non-operation)	Half- sine wave,300m/s^2,11ms	Per table below
10	Package Drop Test	Height: 80cm, 1 corner, 3 edges, 6 surfaces	Per table 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

10. Precautions for Use of LCD Modules

10.1 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.

10.2 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.

10.3 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.

10.4 Storage

a. Store the products in a dark place at +25°C±10°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.

10.5 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.

10.6 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.

