

DLC Display Co., Limited

德爾西顯示器有限公司



MODEL No: DLC1030APL

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Record of Revision

Date	Revision No.	Summary
2017-12-02	1.0	Rev 1.0 was issued

1. Scope

This data sheet is to introduce the specification of DLC1030APL active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 10.3" display area contains 1280 x(RGB) x 480pixels.

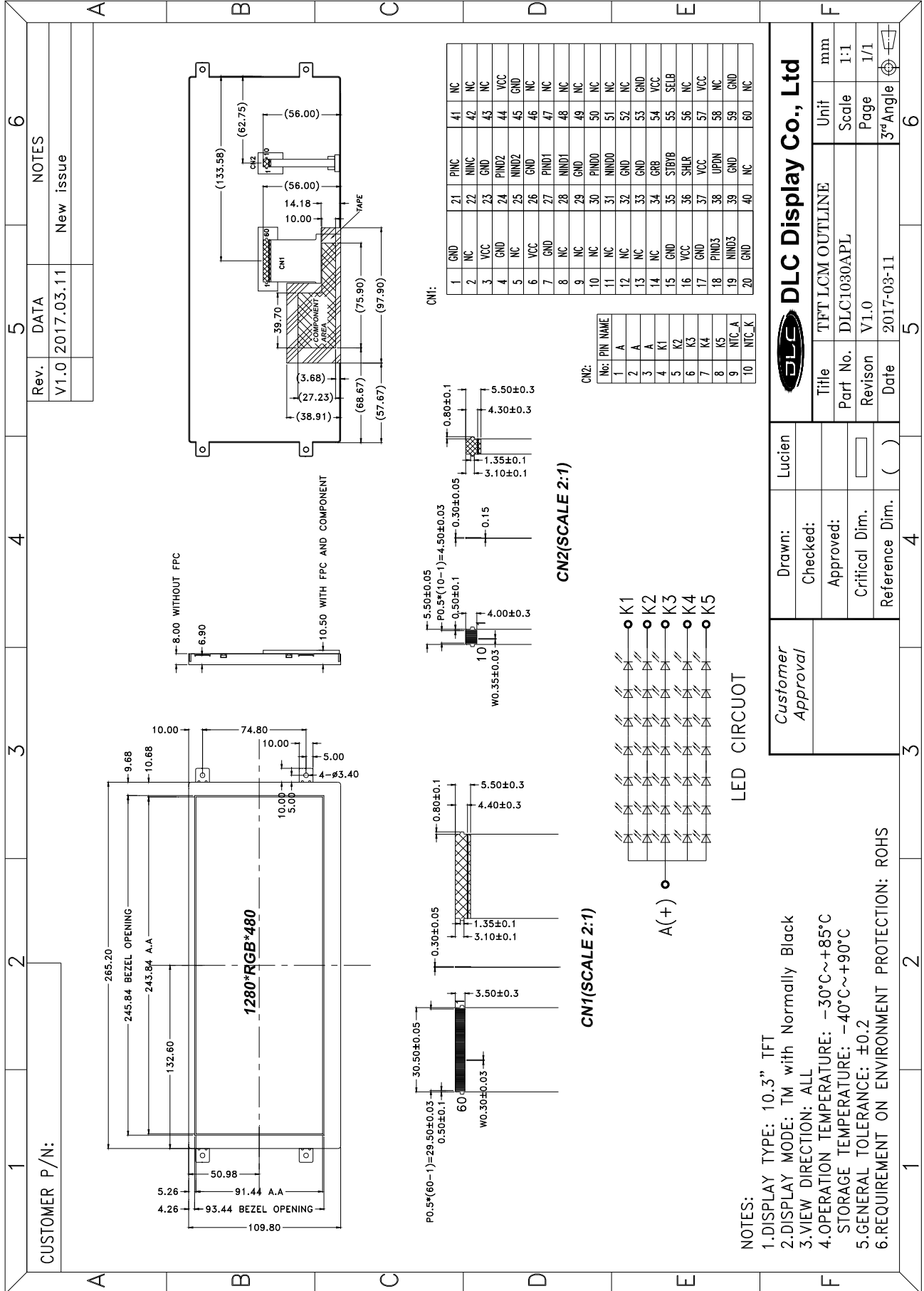
2. Application

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

3. General Information

Item	Contents	Unit
Size	10.3	inch
Resolution	1280X3(RGB) X 480	/
Interface	LVDS	/
Technology type	a-Si TFT	/
Pixel pitch	0.1905x0.1905	mm
Pixel Configuration	RGB vertical stripe	
Outline Dimension (W x H x D)	265.20x109.80x8.00	mm
Active Area	243.84x 91.44	mm
Display Mode	Transmissive Normally Black	/
Viewing Direction	ALL	o'clock
Backlight Type	LED	/

4. Outline Drawing



5. Interface signals
CN1(Input Signal)

Pin NO.	SYMBOL	DESCRIPTION
1	GND	Digital Ground
2	NC	Not connect
3	VCC	LCD power
4	GND	Digital Ground
5	NC	Not connect
6	VCC	LCD power
7	GND	Digital Ground
8	NC	For DLC internal test, please keep it floating
9	NC	For DLC internal test, please keep it floating
10	NC	For DLC internal test, please keep it floating
11	NC	For DLC internal test, please keep it floating
12	NC	For DLC internal test, please keep it floating
13	NC	Not connect
14	NC	Not connect
15	GND	Digital Ground
16	VCC	LCD power
17	GND	Digital Ground
18	PIND3	Positive LVDS differential data input
19	NIND3	Negative LVDS differential data input
20	GND	Digital Ground
21	PINC	Positive LVDS differential clock input
22	NINC	Negative LVDS differential clock input
23	GND	Digital Ground
24	PIND2	Positive LVDS differential data input
25	NIND2	Negative LVDS differential data input
26	GND	Digital Ground
27	PIND1	Positive LVDS differential data input
27	NIND1	Negative LVDS differential data input
29	GND	Digital Ground
30	PIND0	Positive LVDS differential data input
31	NIND0	Negative LVDS differential data input
32	GND	Digital Ground

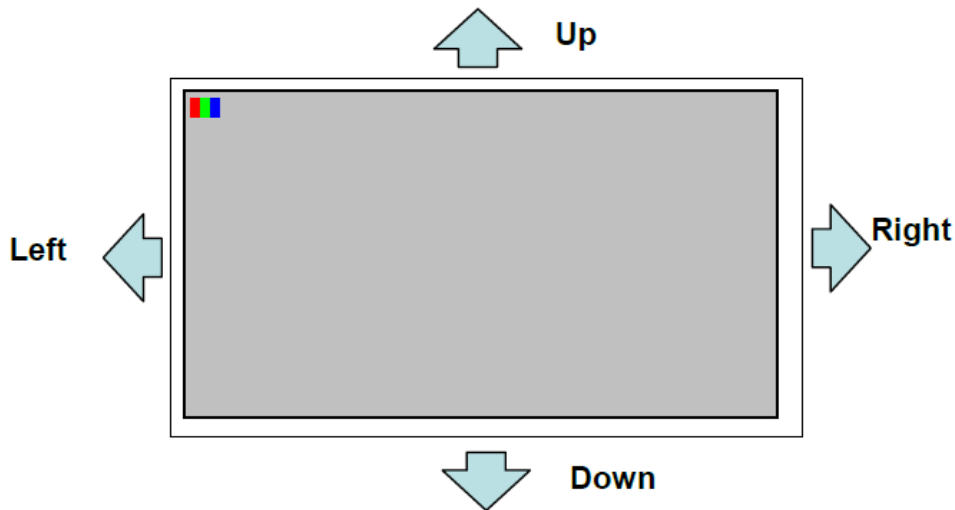


33	GND	Digital Ground
34	GRB	Global reset pin.Active low to enter reset state. Suggest to connecting with an RC reset circuit for stability. Normally pull high.(R=47KΩ,C=1μF)
35	STBYB	Standby mode, normally pull high STBYB="1", normal operation STBYB="0", timing control, source driver will turn off, all output are GND, suggest to turn off AVDD power simultaneously
36	SHLR	Left or right display control
37	VCC	LCD power
38	UPDN	Up/down display control
39	GND	Digital ground
40	NC	Not connect
41	NC	Not connect
42	NC	For DLC internal test, please keep it floating
43	NC	For DLC internal test, please keep it floating
44	VCC	LCD power
45	GND	Digital ground
46	NC	Not connect
47	NC	Not connect
48	NC	Not connect
49	NC	Not connect
50	NC	Not connect
51	NC	Not connect
52	NC	Not connect
53	GND	Digital ground
54	VCC	LCD power
55	SELB	6bit/8bit mode select, SELB = "1", LVDS input data is 8bits SELB = "0", LVDS input data is 6bits
56	NC	Not connect
57	VCC	LCD power
58	NC	Not connect
59	GND	Digital ground
60	NC	Not connect

Remarks : Mating connector : FH52-60S-0.5SH (Hirose)

Note 1 : UPDN and SHLR control function

SHLR	UPDN	Data shifting
VCC	GND	Left→Right, Up→Down(default)
GND	GND	Right→Left, Up→Down
VCC	VCC	Left→Right, Down→Up
GND	VCC	Right→Left, Down→Up



CN2 (LED backlight)

Pin No.	Symbol	Function
1	A	Anode
2	A	Anode
3	A	Anode
4	K1	Cathode 1
5	K2	Cathode 2
6	K3	Cathode 3
7	K4	Cathode 4
8	K5	Cathode 5
9	NTC_A	NTC_ Anode
10	NTV_K	NTC_ Cathode

Note:
Remarks: Mating connector : FH52-10S-0.5SH (HRS)

6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

The following are maximum values which, if exceeded, may cause faulty operation or damage to the unit.

Parameter	Symbol	MIN	MAX	Unit	Remark
Power Supply Voltage	VCC	-0.3	5.0	V	
Signal Input Voltage	NIND0 ~ NIND3 PIND0 ~ PIND3 NINC,PINC	-0.3	VCC+0.3	V	
Pulse forward current (per LED)	I _{fp}	-	120	mA	Note 1,2,3
Forward Current (per LED)	I _f	-	100	mA	

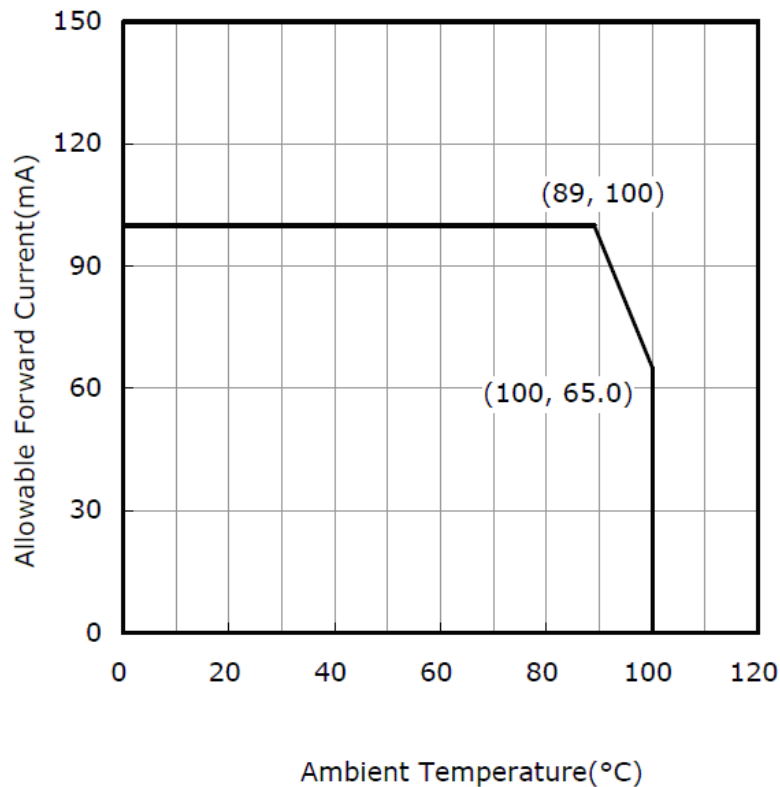
Note 1: If the product were used out of the operation and storage range, it will have quality issue.

Note 2: I_{fp} Conditions : Pulse Width ≤ 10msec · Duty ≤ 1/10.

Note 3: Each one of LED operation must be follow diagram of Ambient Temperature and Allowable Forward Current.

6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-30	85	°C	Note4
Storage Temperature	TSTG	-40	90	°C	Note4



Note 4: If users use the product out off the environmental operation range (temperature and humidity) , it will have visual quality concerns.

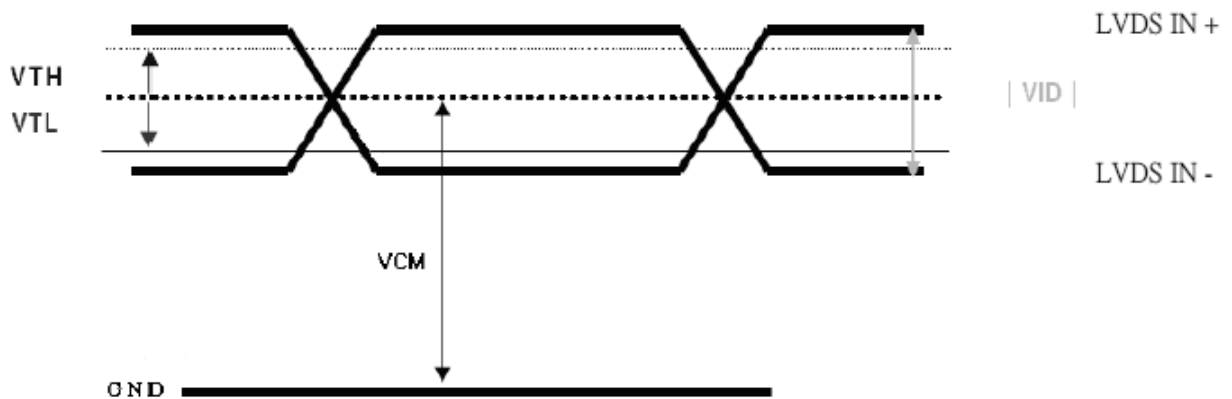
7. Electrical Specifications

7.1 Electrical characteristics

GND=0V, Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Power Supply Voltage For LCD	VCC	3.0	3.3	3.6	V	
Logic Input Voltage (LVDS:IN+,IN-)	VCM	$\frac{ VID }{2}$	-	VCC-1.2	V	Note 1
	VID	200	-	600	mV	Note 1
	VTH	-	-	100	mV	Note 1 VCM=1.2V
	VTL	-100	-	-	mV	
Logic Input Voltage	VIH	0.7*VCC	-	VCC	V	
	VIL	GND	-	0.3*VCC	V	

Note1: LVDS signal



TFT-LCD Current Consumption

Item	Symbol	Condition	Min	Typ	Max	Unit	Note
LCD Power	VCC	VCC=3.3V	-	170	350	mA	Note 1
Total Power Consumption	PC		-	231	1155	mW	Note 1

Note 1: Typical: Under 256 gray pattern
Maximum: Under white pattern



256 gray pattern



White Pattern

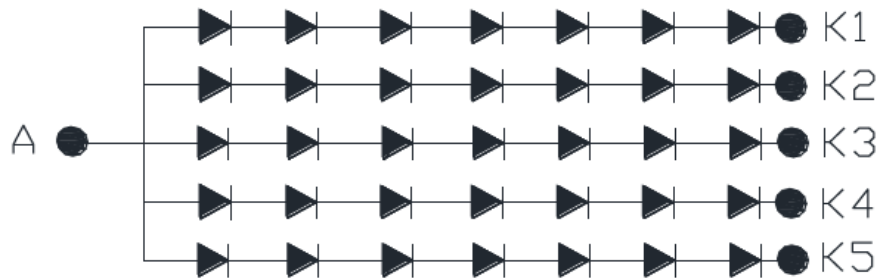
7.2 LED Backlight

Ta=25°C

Item	Symbol	CONDITIONS	MIN	TYP	MAX	Unit	Remark
LED current	IL	Ta=25°C (40mA/serise)	-	200	-	mA	
LED voltage	VL	Ta=25°C (40mA/serise)	18.55	21	24.15	V	
Power consumption	WL	Ta=25°C (40mA/serise)	-	4.2	-	W	
LED Lifetime	-	Ta=60°C IF=40mA	-	30000	-	Hr	

Notes:

1. LED Circuit Diagram



2. A : Anode(+) , K : Cathode(-)

3. Suggestion: Using the constant current control to avoid the leakage light and brightness quality issue.

4. Definition of Led lifetime : Luminance < Initial luminance 70%..

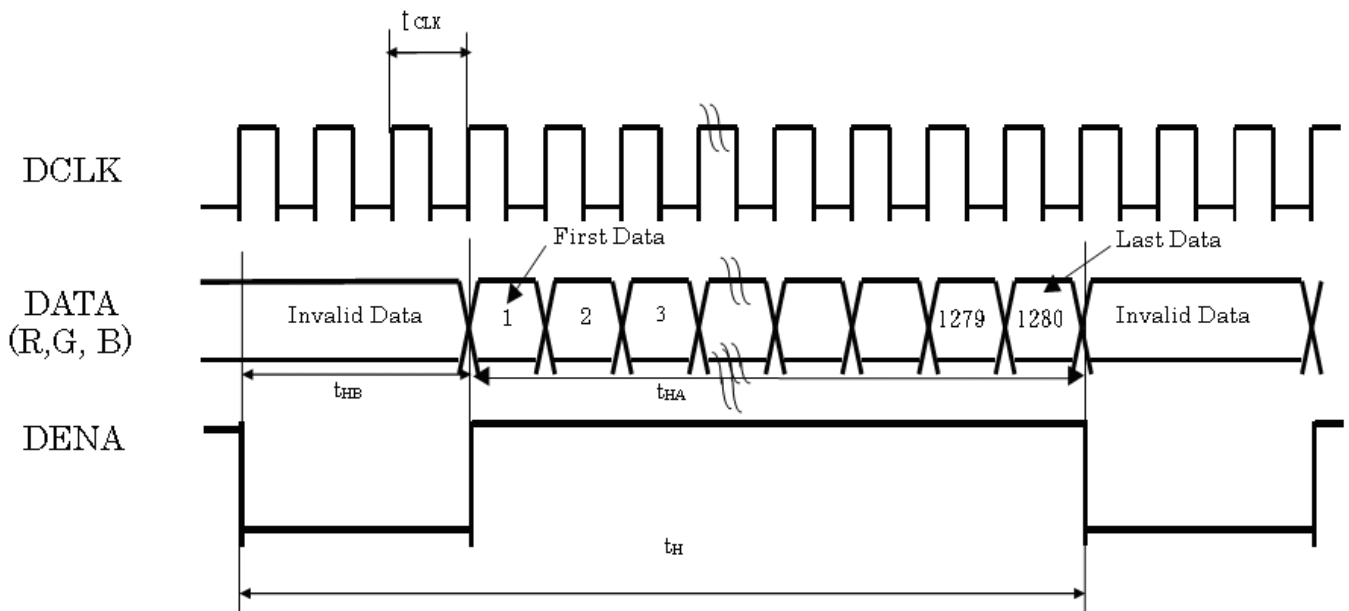
8. Command/AC Timing

8.1 Timing Specification

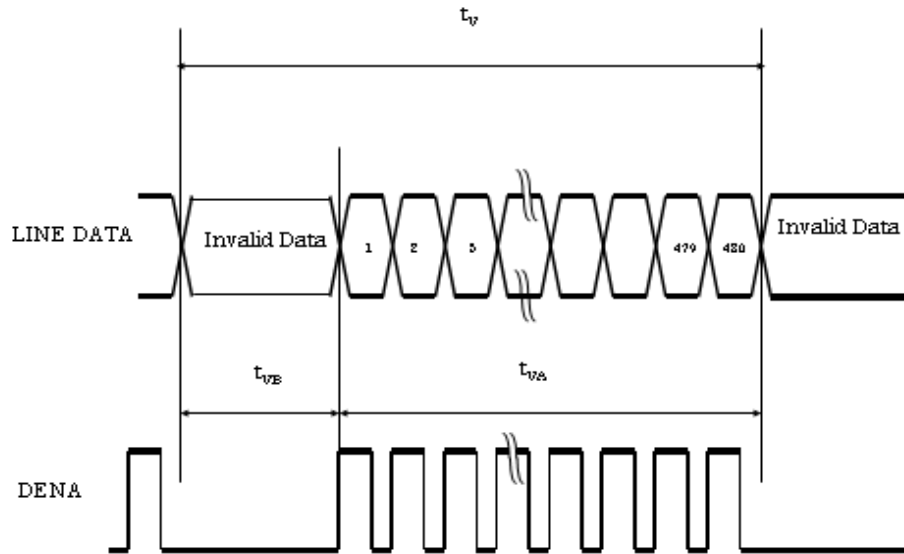
Item			Symbol	Min	Typ	Max	Unit	
LVDS input signal sequence	CLK Frequency		fCLK	47.74	51.19	54.77	MHz	
LCD input signal sequence (Input LVDS Transmitter)	DENA	Horizontal	Horizontal Total Time	tH	1530	1580	1630	tCLK
			Horizontal Effective Time	tHA	1280			tCLK
			Horizontal Blank Time	tHB	250	300	350	tCLK
	Vertical	Vertical Total Time	tV	520	540	560	tH	
		Vertical Effective Time	tVA	480			tH	
		Vertical Blank Time	tVB	40	60	80	tH	

8.2 Timing sequence(Timing chart)

8.2.1 Horizontal Timing Sequence

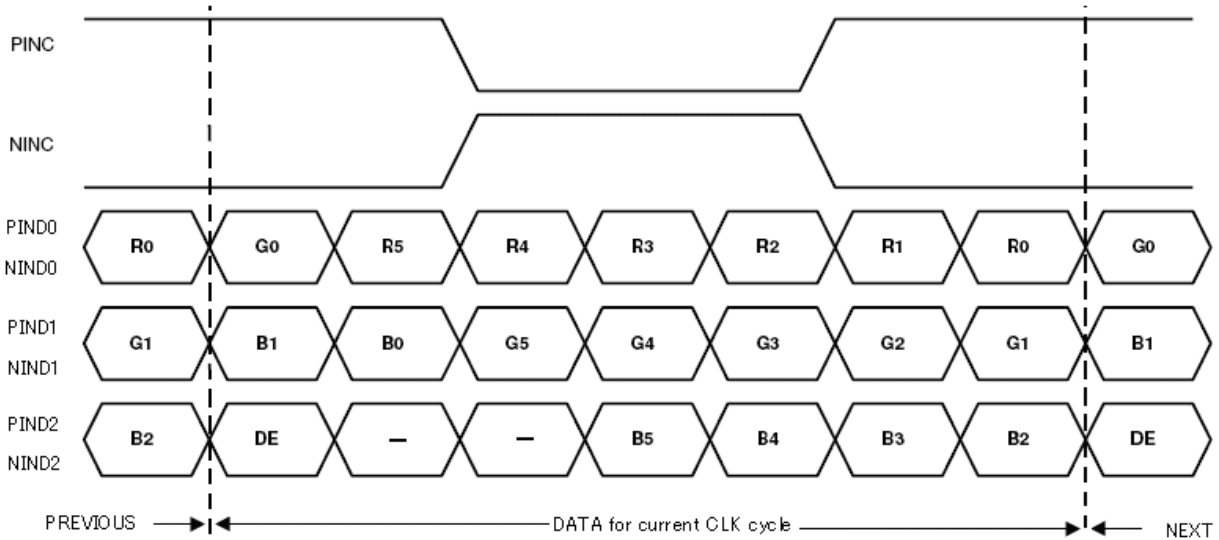


8.2.2 Vertical Timing Sequence

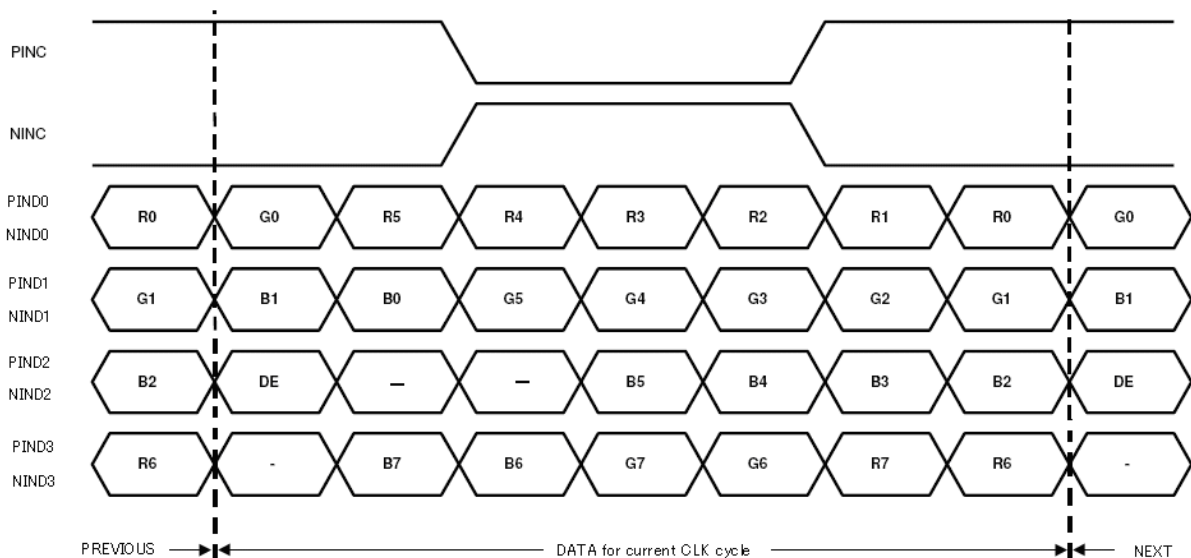


8.2.3 LVDS Input Data mapping

6 Bit LVDS input



8 Bit LVDS input



8.2.4 Color data assignment

COLOR	INPUT DATA	R DATA								G DATA								B DATA							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
		MSB							LSB	MSB							LSB	MSB							LSB
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
RED	RED(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED(1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED(2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	RED(254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	RED(255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GREEN	GREEN(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	GREEN(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	
	GREEN(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
	GREEN(254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	GREEN(255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
BLUE	BLUE(0)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	BLUE(1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	
	BLUE(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	
	BLUE(254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	BLUE(255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Notes:

(1) Gray level:

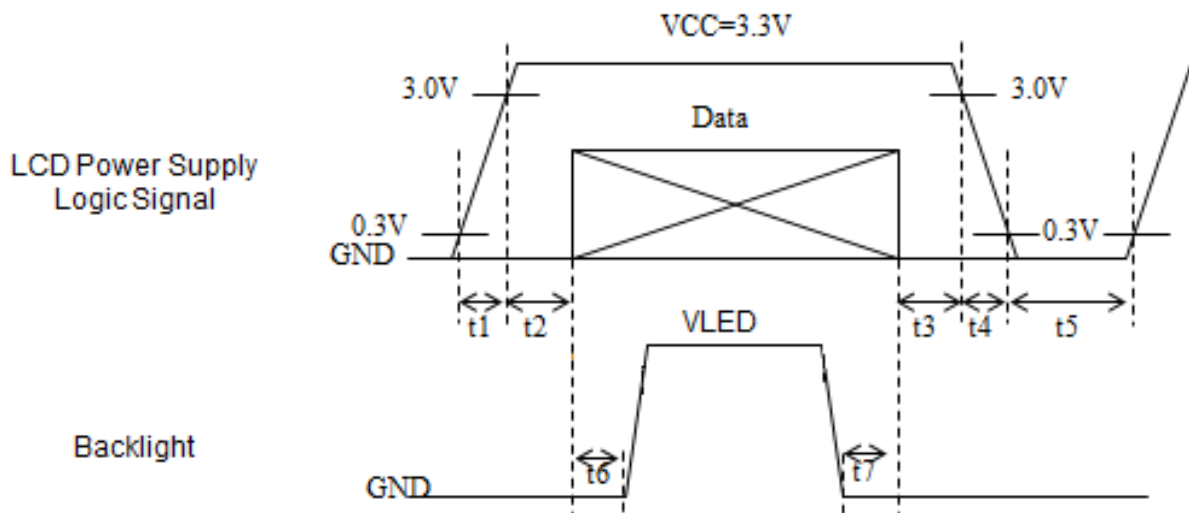
color(n) : n is level order, higher n means brighter level.

(2) Data: 1:high 0:low

8.3 Power、Signal sequence

Power On: VCC→ Video & Logic Signal→ Backlight

Power OFF: Backlight→ Video & Logic Signal→ VCC



- $0.5 < t1 \leq 10ms$
- $0 < t2 \leq 50ms$
- $0 < t3 \leq 50ms$
- $0 < t4 \leq 10ms$
- $200ms \leq t5$
- $200ms \leq t6$
- $200ms \leq t7$
- $10ms \leq t8$
- $10ms \leq t9$

9. Optical Specification

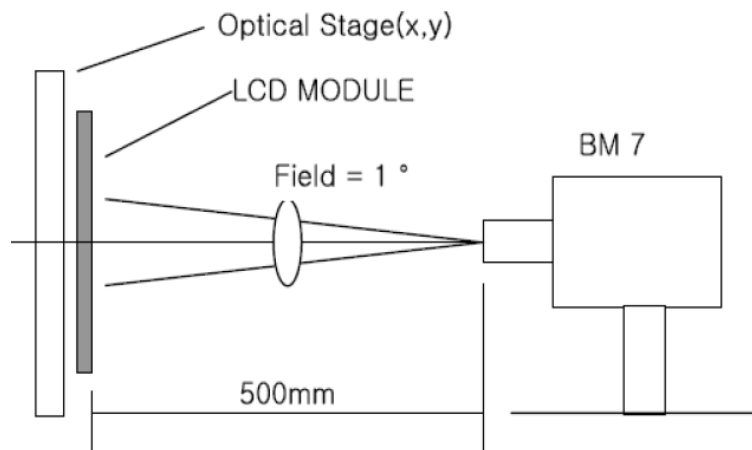
Ta=25°C

Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio	CR	$\theta=0^\circ$	800	1000	-		Note1 Note2
Response Time	Ton/ Toff	25°C	-	25	35	ms	Note1 Note3
View Angles	θT	$CR \geq 10$	75	85	-	Degree	Note 4
	θB		75	85	-		
	θL		75	85	-		
	θR		75	85	-		
Chromaticity	White	x	Brightness is on	0.253	0.293	0.333	Note5, Note1
		y		0.259	0.299	0.339	
	Red	x		0.609	0.649	0.689	
		y		0.301	0.341	0.381	
	Green	x		0.269	0.309	0.349	
		y		0.603	0.643	0.683	
	Blue	x		0.107	0.147	0.187	
		y		0.049	0.089	0.129	
NTSC			60	70		%	
Luminance	L		450	700	-	cd/m ²	Note1 Note6
Uniformity	U		70	85	-	%	Note1 Note7

Note 1: Definition of optical measurement system.

Temperature = 25°C(±3°C)

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

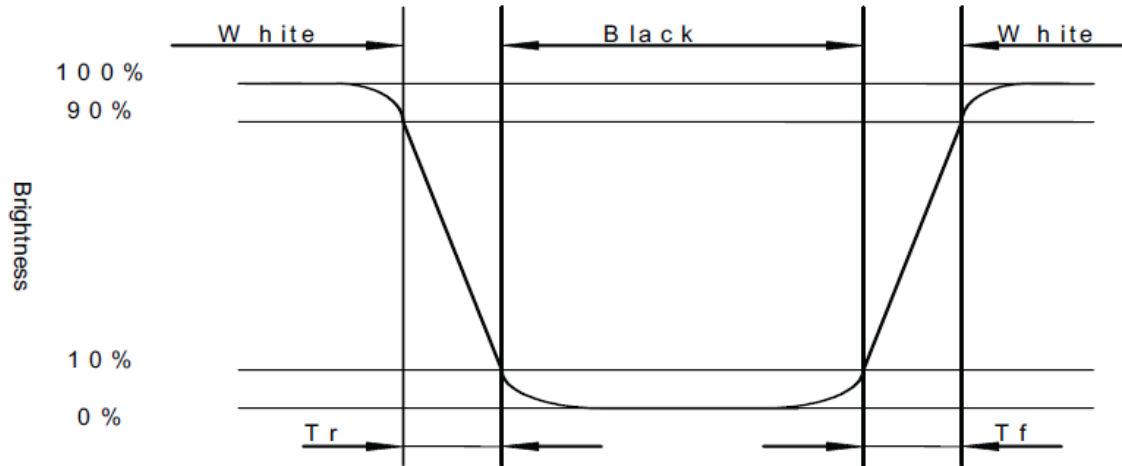


Note 2: Contrast ratio is defined as follow:

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

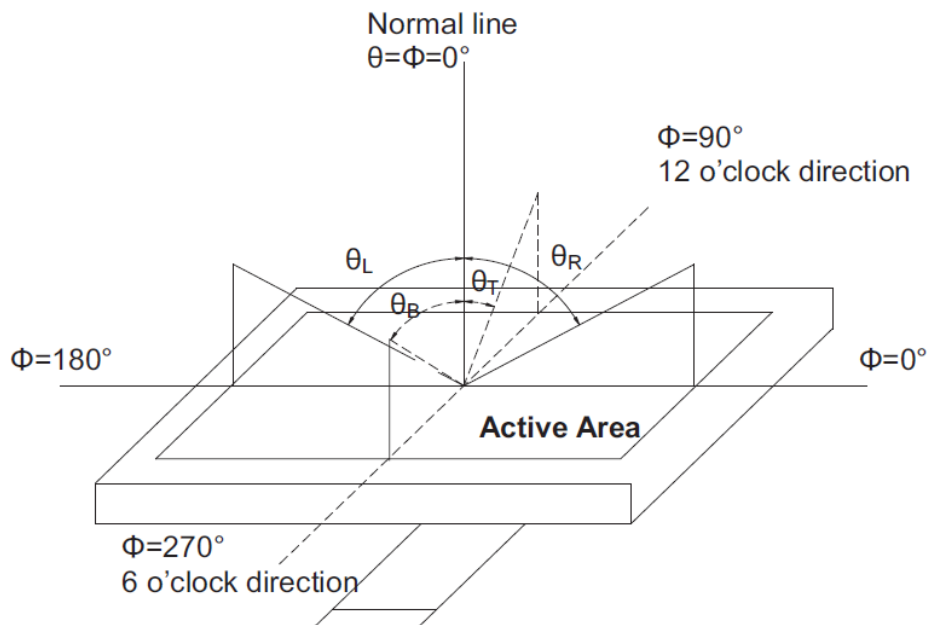
Note 3: Response time is defined as follow:

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



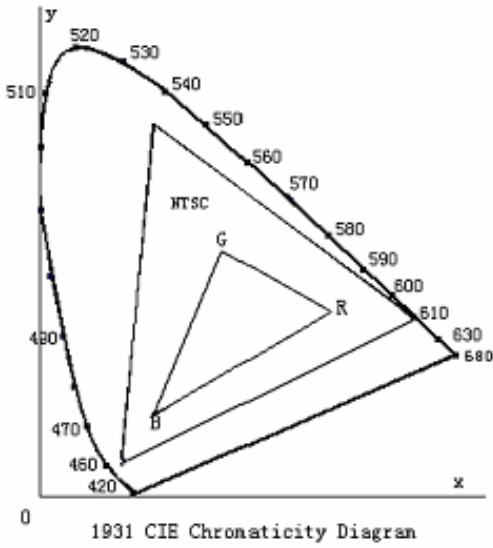
Note 4: Viewing angle range is defined as follow:

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.



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

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.

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

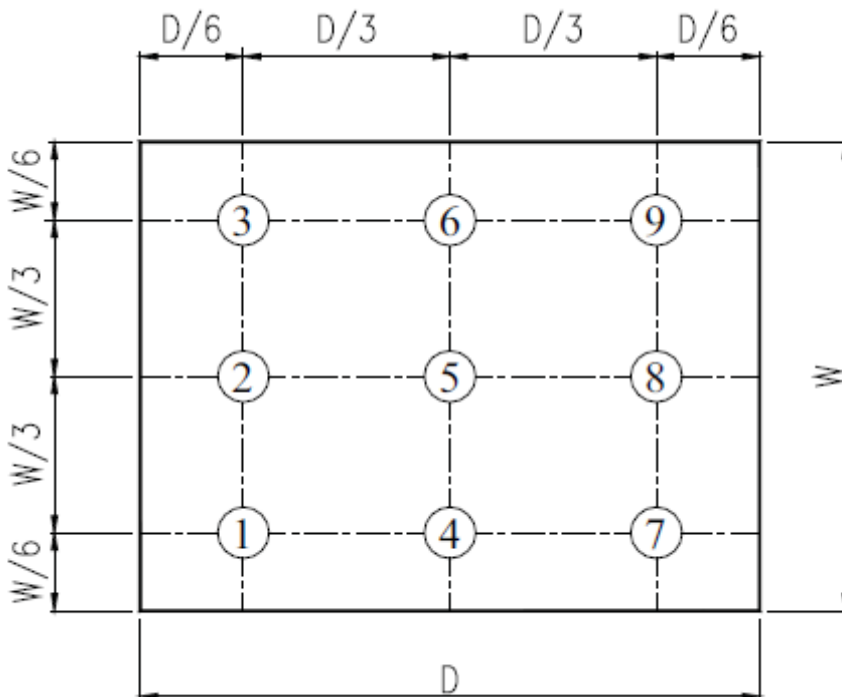


Fig. 2 Definition of uniformity

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+85°C, 120hrs	Per table in below
2	Low Temp Operation	Ta=-30°C, 120hrs	Per table in below
3	High Temp Storage	Ta=+90°C, 120hrs	Per table in below
4	Low Temp Storage	Ta=-40°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)	-40°C 30 min~+90°C 30 min, Change time:5min, 10 Cycles	Per table in below
7	ESD (Operation)	150pF , 330Ω , ±8kV&±15kV air& contact test 200pF , 0Ω , ±200V contact test	Per table in below
8	Vibration (Non-operation)	Frequency range:8~33.3Hz, Stroke:1.3mm Vibration: sinusoidal wave, perpendicular axis(both x, z axis: 2hrs ,y axis: 4hrs). Sweep: 2.9G,33.3 Hz -400 Hz Cycle time: 15 min	Per table in below
9	Shock (Non-operation)	Shock level: 980m/s ² (equal to 100G). Waveform: half sinusoidal wave,6ms. Number of shocks: +X,+Y,+Z each axis 3 times	Per table in below
10	Package Drop Test	Height:80 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.
- F. Peel off the LCM protective film slowly since static electricity may be generated.

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.

In order to make the display assembly stable and firm, DLC recommends to design some supporting at the display backside, especially for the display with tape-attached touch panel, such supporting is important and essential, or else, the display may drop-off from front after some period of time.

