

DLC Display Co., Limited

德爾西顯示器有限公司





Record of Revision

Date	Revision No.	Summary
2015-06-11	1.0	Rev 1.0 was issued
2016-03-20	1.1	Update the backlight

1. Scope

This data sheet is to introduce the specification of DLC0700AZG, active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 7.0" display area contains 1204X3 (RGB) x 600 pixels.

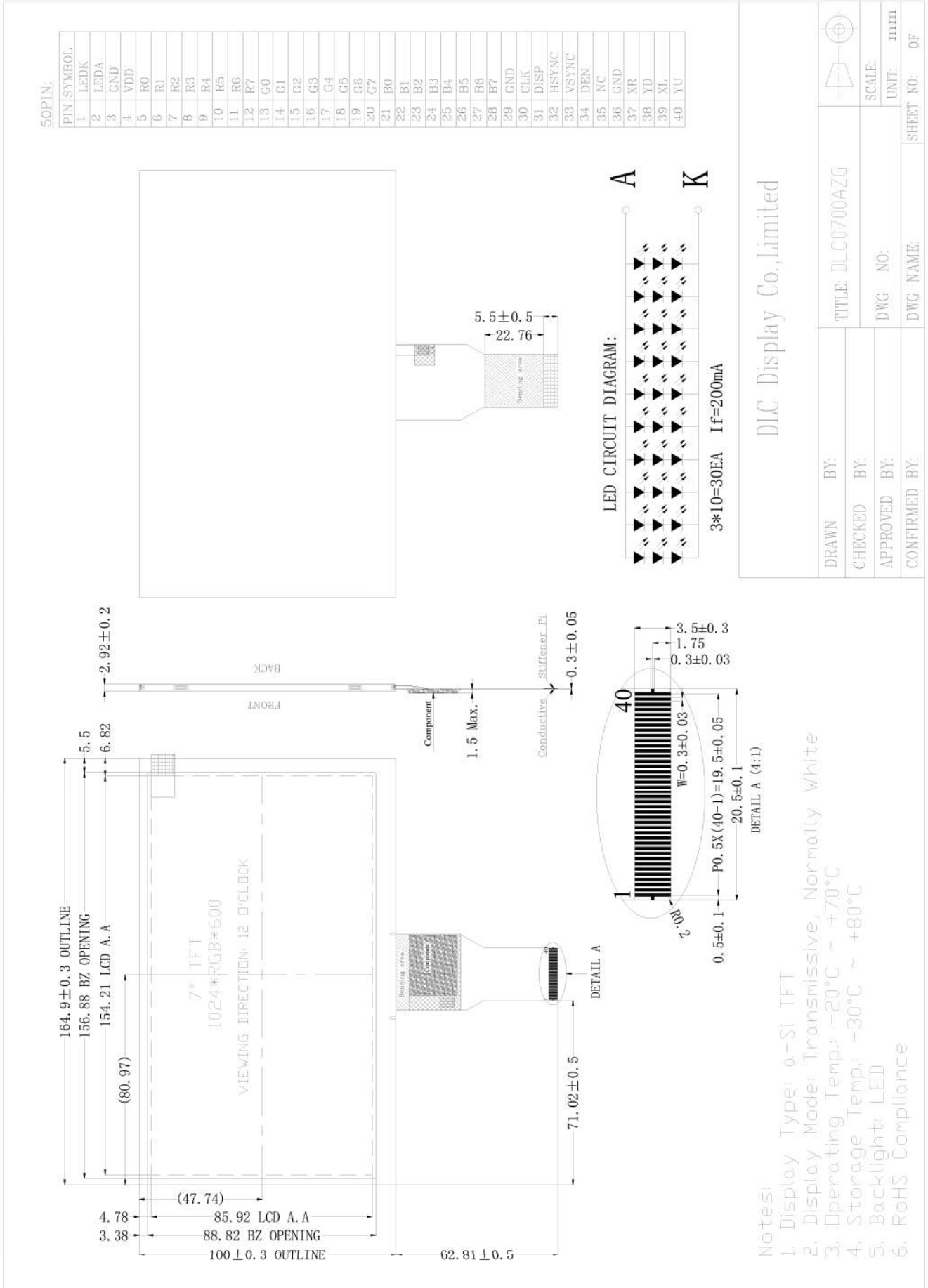
2. Application

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

3. General Information

Item	Contents	Unit
Size	7.0	inch
Resolution	1024X3(RGB) x 600	/
Interface	Parallel8-bit RGB	/
Technology type	a-Si TFT	/
Pixel Configuration	R.G.B. Stripe	
Outline Dimension (W x H x D)	164.9X100.0X2.92	mm
Active Area	154.21X85.92	mm
Display Mode	Transmissive, Normally white	/
Backlight Type	LED	/
Weight	TBD	g

4. Outline Drawing



5. Interface signals

Pin No.	Symbol	I/O	Function
1	LEDK	P	LED back light(Cathode)
2	LEDA	P	LED back light(Anode)
3	GND	P	Ground.
4	VDD	P	Power supply
5-12	R0~R7	I	Red data bus
13-20	G0~G7	I	Green data bus
21-28	B0~B7	I	Blue data bus
29	GND		Ground.
30	CLK	I	Data clock
31	DISP	I	Nomal diplay and Standby mode select pin
32	HSYNC	I	Line sync signal
33	VSYNC	I	Frame sync signal
34	DE	I	Data enable pin
35	NC		No connection.
36	GND	P	Ground.
37	XR	O	Touch Panel Control pin(NC)
38	YD	O	
39	XL	O	
40	YU	O	

Note: Recommend connector Part No.: FH12S-40S-0.5SH(55)

6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	VDD	-0.3	3.6	V	1, 2

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. $V_{CC} > V_{SS}$ must be maintained.

6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-20	70	°C	
Storage Temperature	TSTG	-30	80	°C	

Notes:

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. $T_a \leq 40^\circ\text{C}$: 85%RH MAX.
 $T_a > 40^\circ\text{C}$: Absolute humidity must be lower than the humidity of 85%RH at 40°C

7. Electrical Specifications

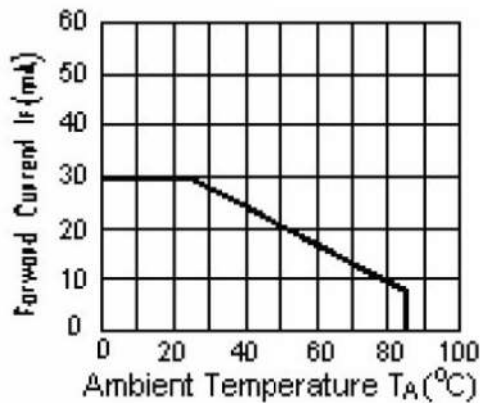
7.1 Electrical characteristics

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note	
Power supply	VDD	Ta=25°C	3.0	3.3	3.6	V		
Input voltage	'H'	V _{IH}	VDD=3.3V	0.8VDD	-	VDD	V	
	'L'	V _{IL}	VDD=3.3V	0	-	0.2VDD	V	
Current Consumption	I _{CC1}	Normal mode	-	115	130	mA	1	
	I _{CC2}	Sleep mode	-	0.05	0.1	mA	1	
Clock Frequency	f _{CLK}	-	-	30	50	MHz		

7.2 LED Backlight

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I _F	-	200	-	mA	
Forward Voltage	V _F	-	9.0	-	V	
LED life time	--	-	30,000	--	Hr	Note

Note.: The "LED Life time" is defined as the module brightness decrease to 50% original brightness at T=25°C and I_{LED} = 20X10mA. The LED Life time could be decreased if operating I_{LED} is larger than 20X10mA



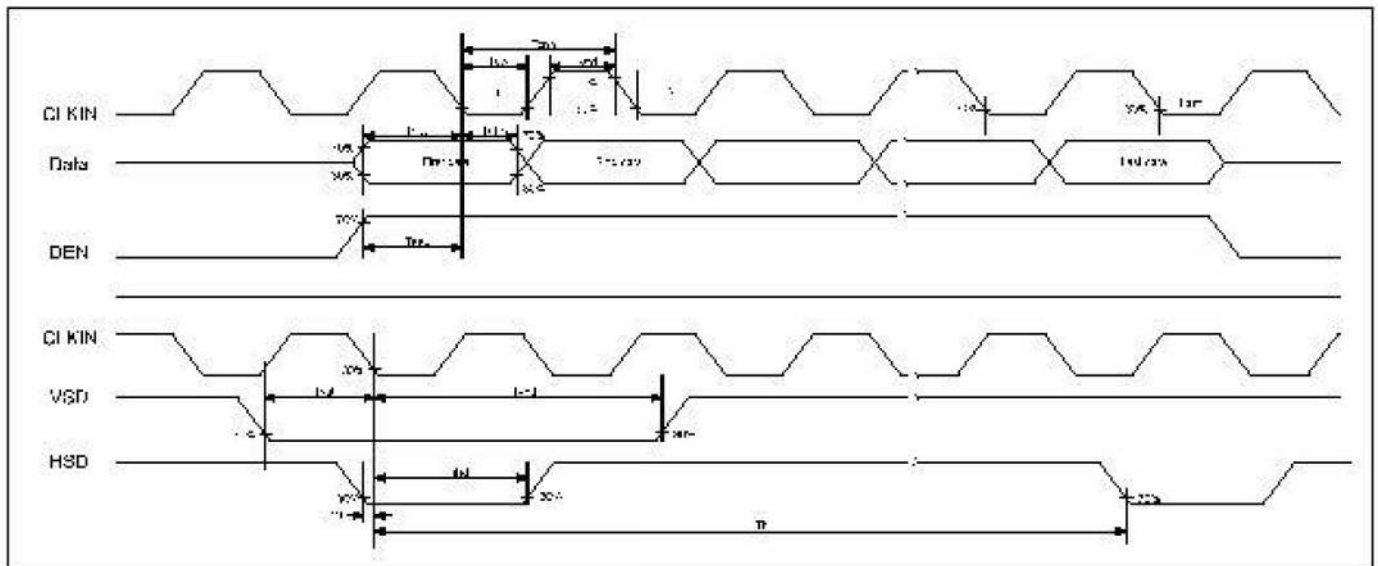
I_{LED} VS TEMP

8. Command/AC Timing

8.1 AC Electrical Characteristics

Parameter	Symbol	Spec.			Unit	Condition
		Min.	Typ.	Max.		
VDD Power On Slew rate	T_{POR}	-	-	20	ms	From 0V to 90% VDD
GRB pulse width	T_{GRB}	50	-	-	μ s	-
DCLK cycle time	T_{cch}	14	-	-	ns	-
DCLK pulse duty	T_{cwh}	40	50	60	%	-
VSD setup time	T_{vst}	5	-	-	ns	-
VSD hold time	T_{vhd}	5	-	-	ns	-
HSD setup time	T_{hst}	5	-	-	ns	-
HSD hold time	T_{hhd}	5	-	-	ns	-
Data set-up time	T_{dsu}	5	-	-	ns	D0[7:0], D1[7:0], D2[7:0] to DCLK
Data hold time	T_{dhd}	5	-	-	ns	D0[7:0], D1[7:0], D2[7:0] to DCLK
DE setup time	T_{esu}	5	-	-	ns	-
DE hold time	T_{ehd}	5	-	-	ns	-
Output stable time	T_{sst}	-	-	6	μ s	10% to 90% target voltage. CL=90pF, R=10K ohm (Cascode) Dual gate
				3		

8.2 Input Clock and Data Timing Diagram



8.3 Timing

- DE mode

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	folk	40.8	51.2	67.2	MHz
Horizontal Display Area	thd	1024			DCLK
HSD Period	th	1114	1344	1400	DCLK
HSD Blanking	thb+ thfp	90	320	376	DCLK
Vertical Display Area	tvd	600			T _H
VSD Period	tv	610	635	800	T _H
VSD Blanking	tvbp+ tvfp	10	35	200	T _H

- HV mode

Horizontal timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
DCLK Frequency	folk	44.9	51.2	63	MHz
Horizontal Display Area	thd	1024			DCLK
HSD Period	th	1200	1344	1400	DCLK
HSD Pulse Width	thpw	1	-	140	DCLK
HSD Back Porch	thbp	160			DCLK
HSD Front Porch	thfp	16	160	216	DCLK

Vertical Timing

Parameter	Symbol	Spec.			Unit
		Min.	Typ.	Max.	
Vertical Display Area	tvd	600			T _H
VSD Period	tv	624	635	750	T _H
VSD Pulse Width	tvpw	1	-	20	T _H
VSD Back Porch	tvbp	23			T _H
VSD Front Porch	tvfp	1	12	127	T _H

8.4 Data Input Format

Vertical timing

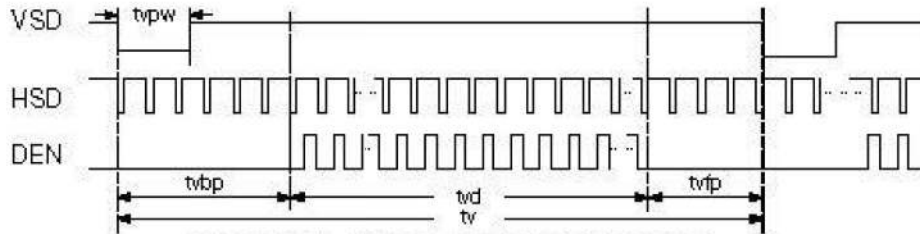


Figure 10.2: Vertical Input timing diagram

Horizontal timing

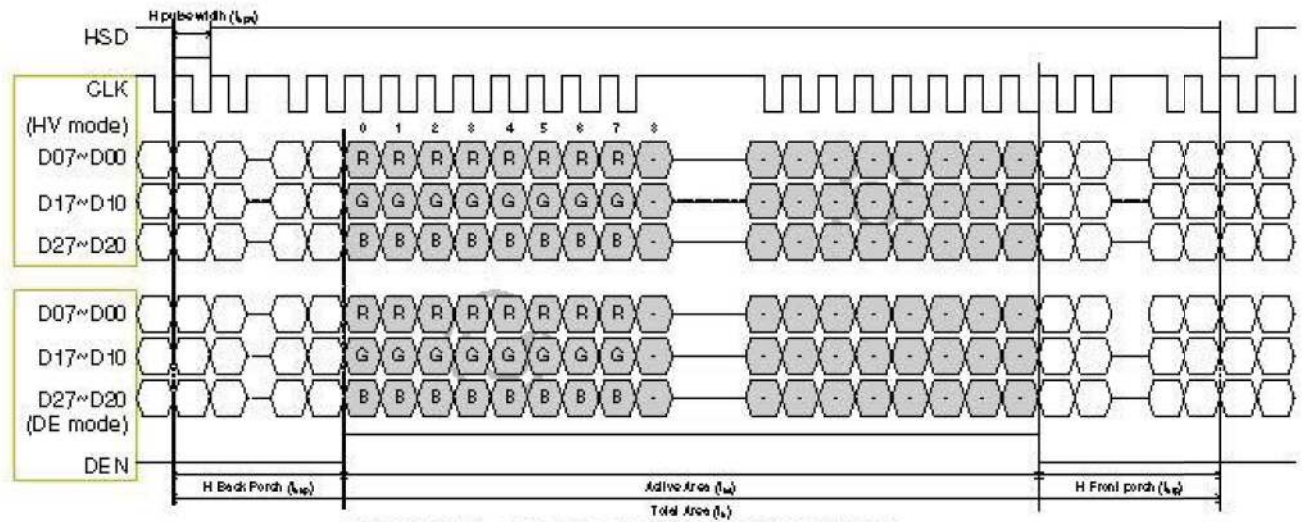


Figure 10.3: Horizontal Input timing diagram

8.5 Power ON/Off Sequence

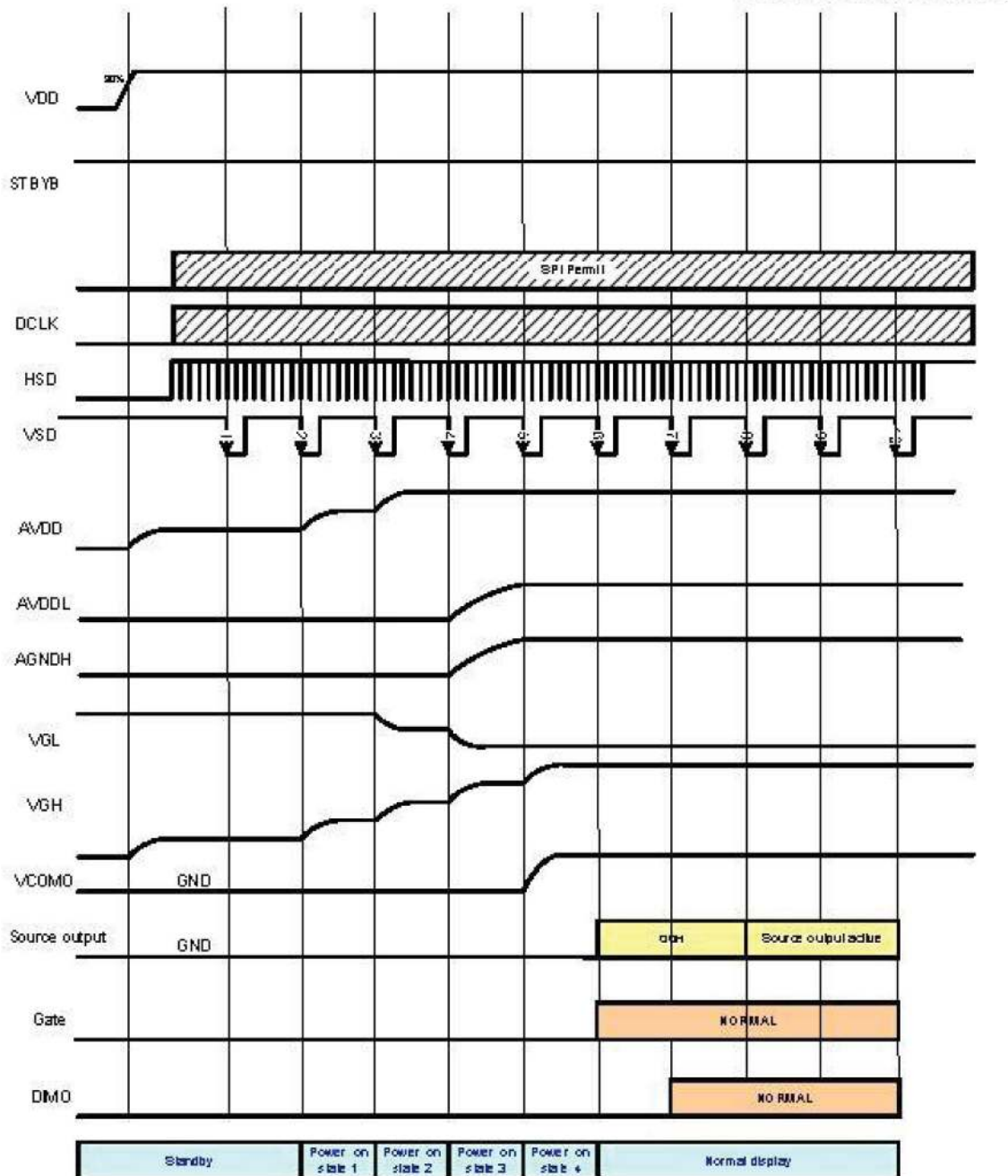
To prevent the device damage from latch up, the power on/off sequence shown below must be followed.

Power on: VDD, GND→AVDD, AGND→V1 to V14

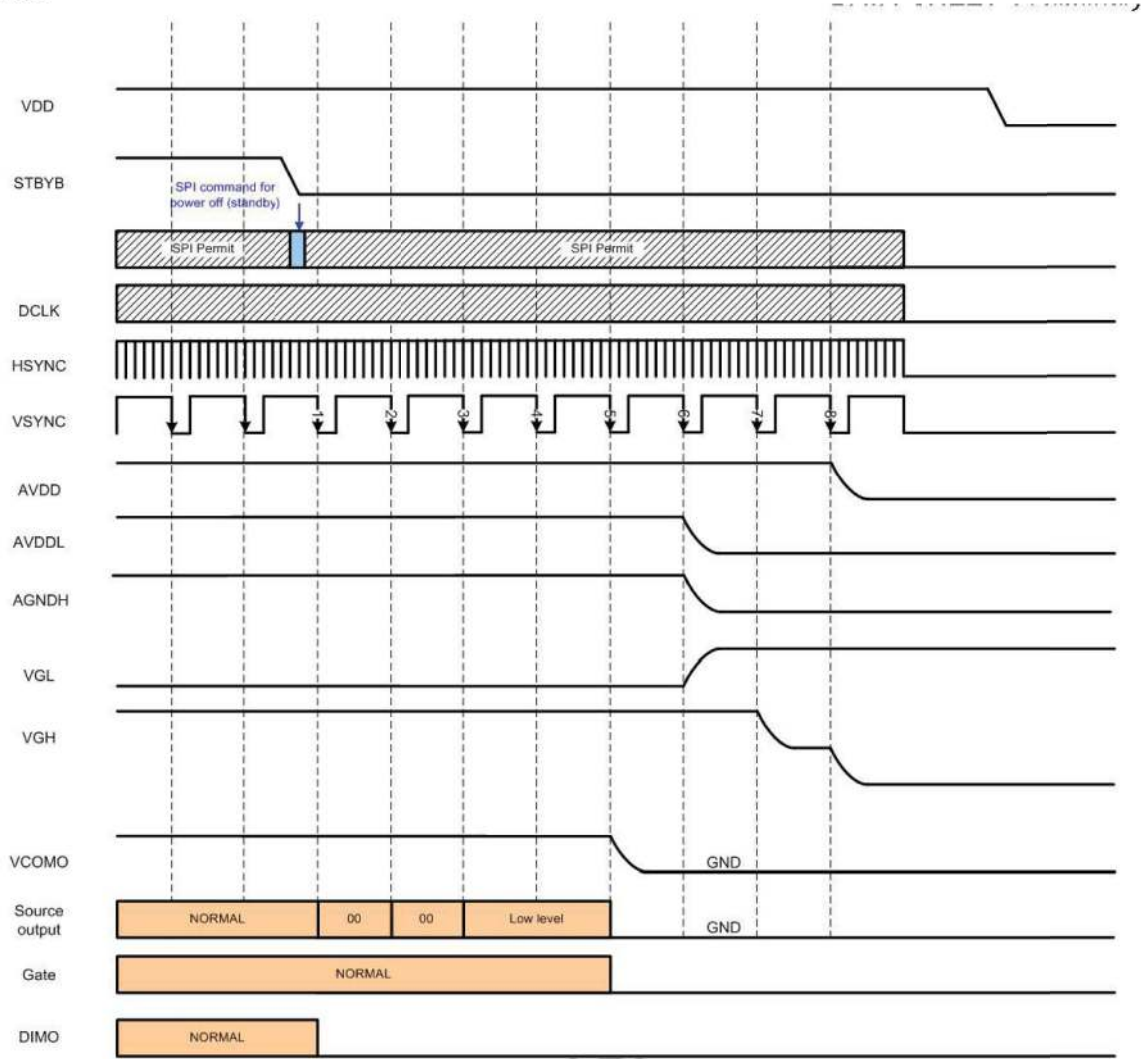
Power off: V1 to V14 →AVDD, AGND→VDD, GND

In order to prevent IC from power on reset fail, the rising time (T_{POR}) of the digital power supply VDD should be maintained within the given specifications.

a. Power on



b. Power off



Note: Low level=3FH, when NBW=L (Normally white)
 Low level=00H, when NBW=H (Normally black)

9. Optical Specification

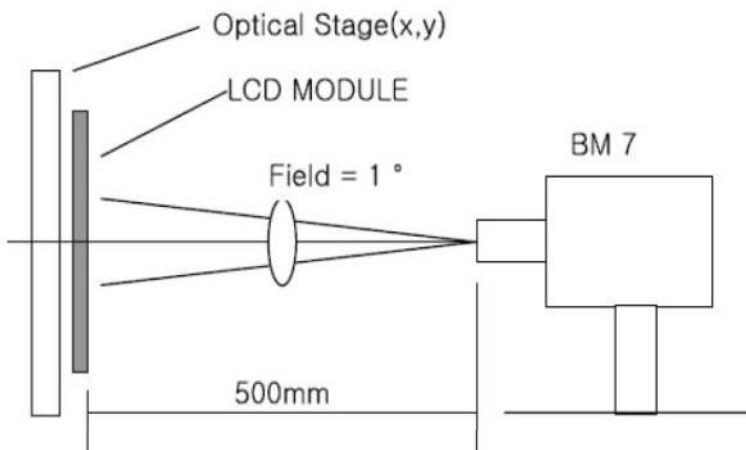
Ta=25°C

Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark		
Contrast Ratio	CR	$\theta=0^\circ$	300	500	-		Note1 Note2		
Response Time	Ton	25°C	-	10	-	ms	Note1 Note3		
	Toff		-	10	-				
View Angles	θT	$CR \geq 10$	-	65	-	Degree	Note 4		
	θB		-	55	-				
	θL		-	65	-				
	θR		-	65	-				
Chromaticity	White	Brightness is on	TYP-0.05	TYP+0.05			Note5, Note1		
								x	0.28
	y							0.33	
	Red							x	0.51
								y	0.34
	Green							x	0.31
								y	0.56
	Blue							x	0.15
y		0.14							
Luminance	L		-	500	-	cd/m ²	Note1 Note6		
Uniformity	U		75		-	%	Note1 Note7		
NTSC			50	60		%			

Note 1: Definition of optical measurement system.

Temperature = 25°C(±3°C)

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

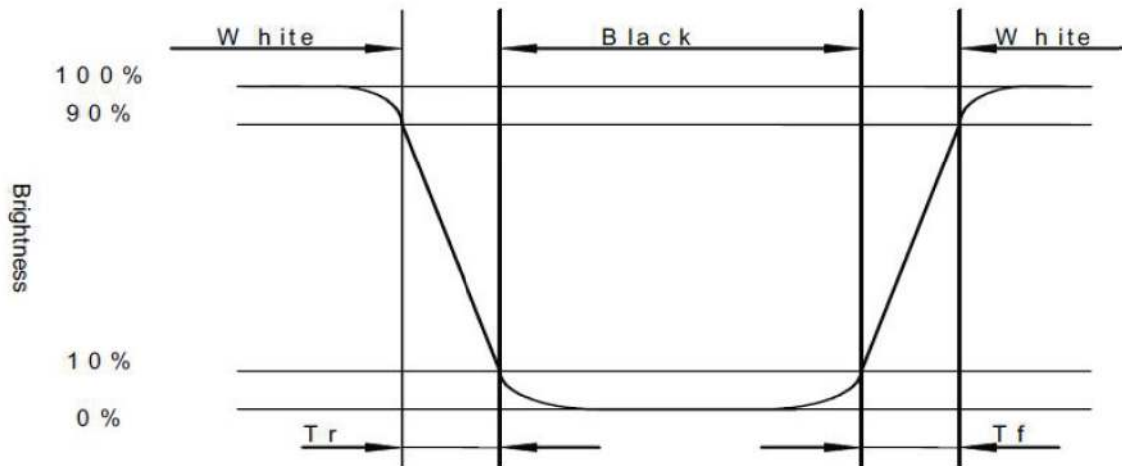


Note 2: Contrast ratio is defined as follow:

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

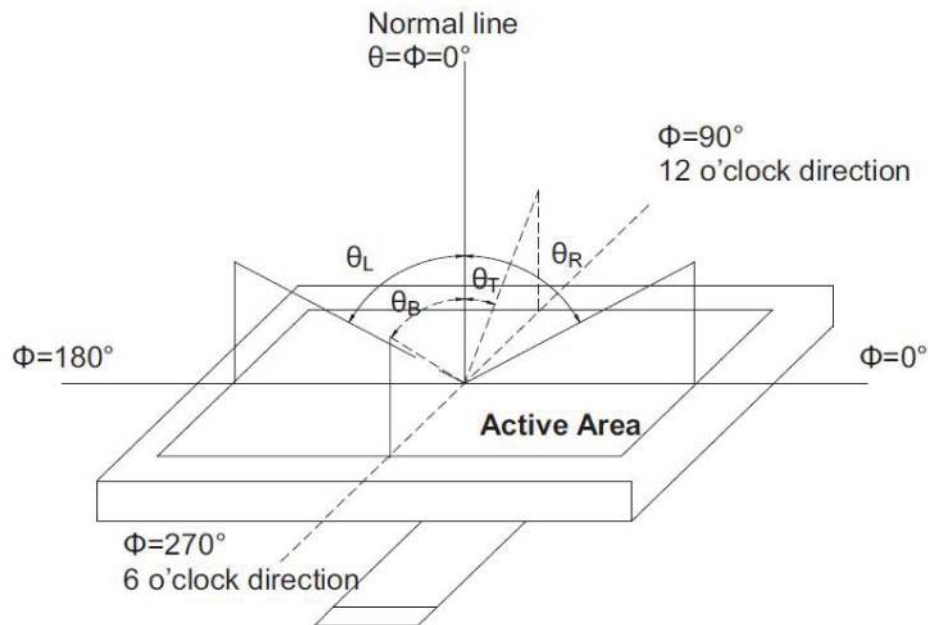
Note 3: Response time is defined as follow:

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).



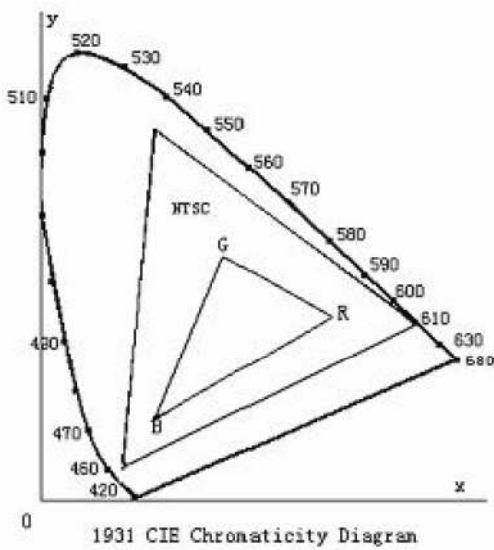
Note 4: Viewing angle range is defined as follow:

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.

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

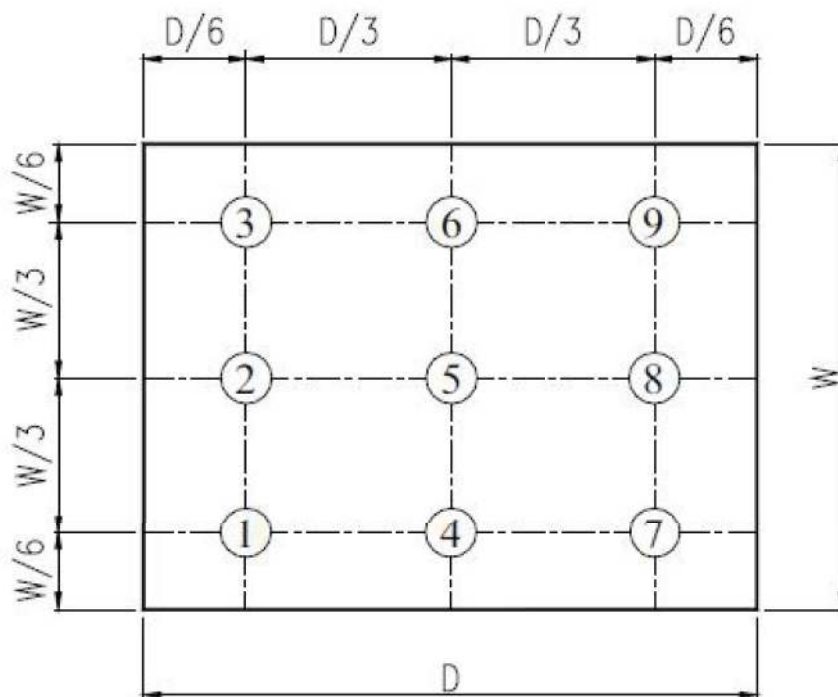


Fig. 2 Definition of uniformity

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temperature Storage	80°C±2°C 96H Restore 2H at 25°C Power off	Per table in below
2	Low Temperature Storage	-30°C±2°C 96H Restore 2H at 25°C Power off	Per table in below
3	High Temperature Operation	70°C±2°C 96H Restore 2H at 25°C Power on	Per table in below
4	Low Temperature Operation	-20°C±2°C 96H Restore 4H at 25°C Power on	Per table in below
5	High Temperature/Humidity Operation	60°C±2°C 90%RH 96H Power on	Per table in below (polarizer discoloration is excluded)
6	Temperature Cycle	--30°C ←-----→80°C 30min 5min 30min after 5 cycle, Restore 2H at 25°C Power off	Per table in below
7	Vibration Test	10Hz~150Hz, 100m/s ² , 120min	Per table in below
8	Shock Test	Half- sine wave,300m/s ² ,11ms	Per table in below
9	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.

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.

