

DLC Display Co., Limited

德爾西顯示器有限公司



MODEL No:DLC0143AZG

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Record of Revision

Date	Revision No.	Summary
2015-08-05	1.0	Rev 1.0 was issued
2015-12-20	2.0	Change FPC and interface
2016-09-07	2.1	Add Optical Character

1. Scope

This data sheet is to introduce the specification of DLC0143AZG active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 1.43" display area contains 240(RGB) x280 pixels.

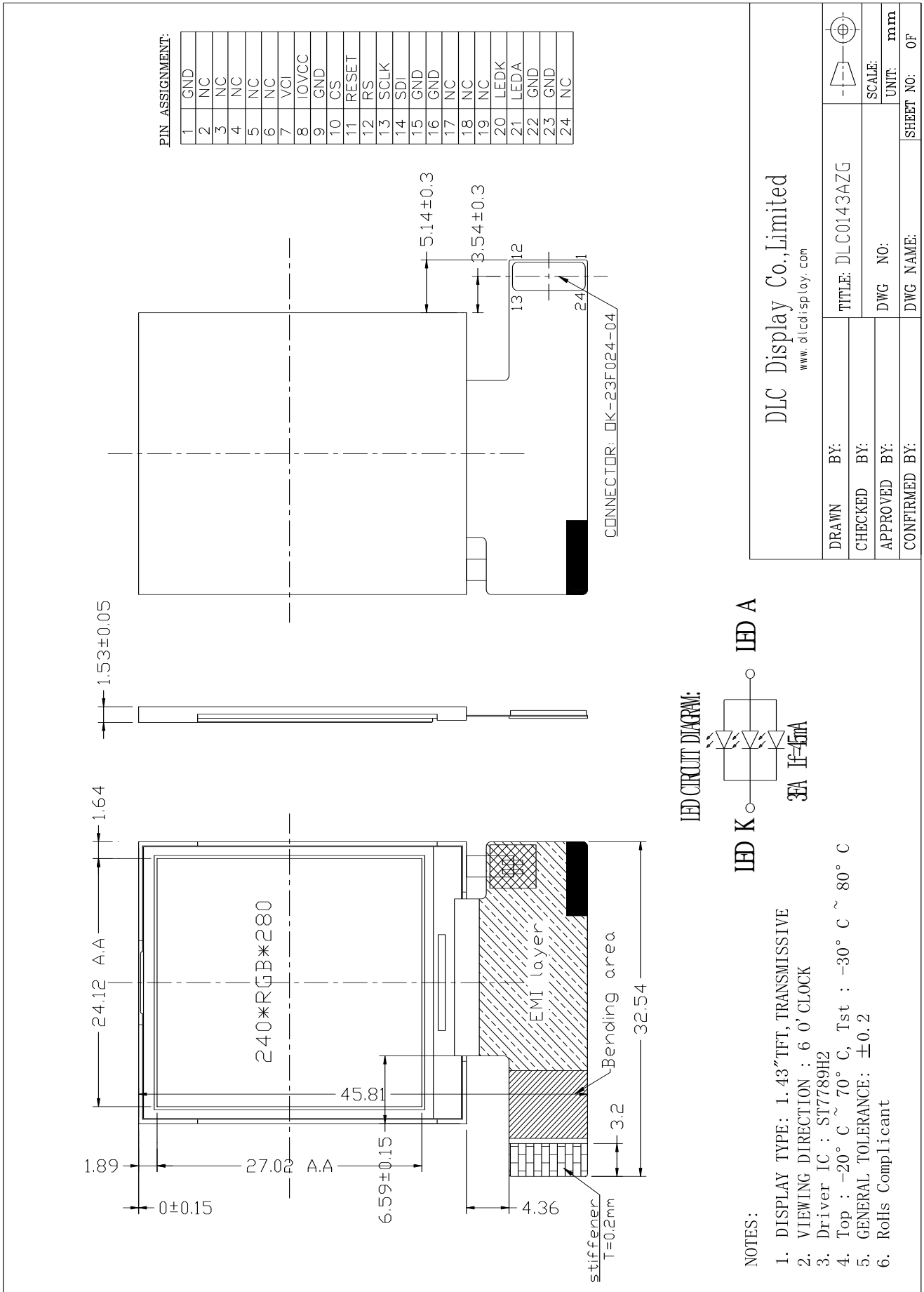
2. Application

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

3. General Information

Item	Contents	Unit
Size	1.43	inch
Resolution	240(RGB) x 280	/
Interface	SPI	/
Technology type	a-si TFT	/
Pixel Configuration	R.G.B. Vertical Stripe	
Outline Dimension (W x H x D)	27.4×33.45×1.53	mm
Active Area	24.12×27.02	mm
Display Mode	Transmissive, Normally white	/
Viewing Direction	6 o'clock	/
Backlight Type	3 LED	/
Driver IC	ST7789H2	/
Weight	TBD	g

4. Outline Drawing



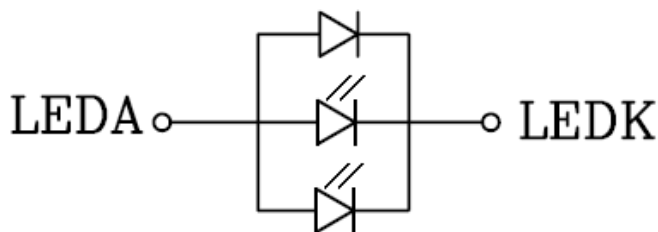
DLC Display Co., Limited www.dlcdisplay.com		TITLE: DLC0143AZG		SCALE:	
DRAWN BY:	CHECKED BY:	DWG NO:	DWG NAME:	SHEET NO:	OF
APPROVED BY:	CONFIRMED BY:				

5. Interface signals

Pin No.	Symbol	Functional	Remark
1	GND	System ground,GND=0V	
2-6	NC	NC	
7	VCI	Power Supply for logic circuits(2.3-4.8V)	
8	IOVCC	Power Supply for Digital circuits and IO pads(1.65-3.3V)	
9	GND	System ground,GND=0V	
10	CS	Chip selection input pin: Active "L"	
11	RESET	Reset Pin	
12	RS	Display data/command selection pin	
13	SCLK	The pin used as serial clock pin	
14	SDI	SPI interface input/output pin	
15-16	GND	System ground,GND=0V	
17-19	NC	NC	
20	LEDK	Cathode for back light driver voltage	
21	LEDA	Anode for back light driver voltage	
22-23	GND	System ground,GND=0V	
24	NC	NC	

6. BACKLIGHT CHARACTERISTICS

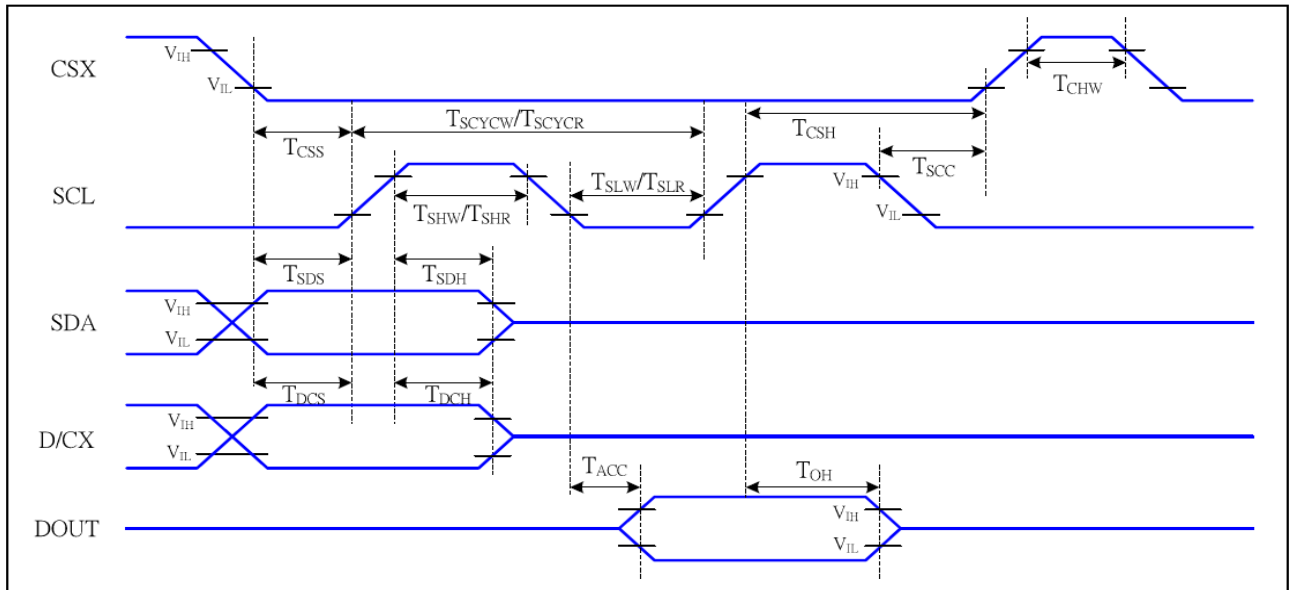
Item	Symbol	Min	Typ	Max	Unit
Forward Voltage	Vf	2.8	3.2	3.3	V
LED current	IF	-	45	-	mA
Number of LED	-	-	3	-	Piece



LED CIRCUIT DIAGRAM:

7. Command/AC Timing

7.1 Timing chart

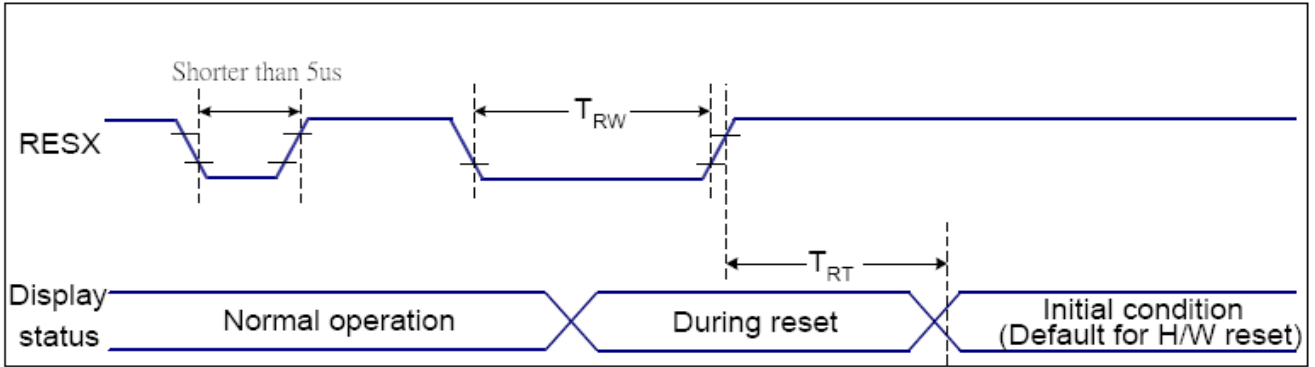


4-line serial Interface Timing Characteristics

V_{DDI}=1.65 to 3.3V, V_{DD}=2.4 to 3.3V, A_{GND}=D_{GND}=0V, T_a=-30 to 70 °C

Signal	Symbol	Parameter	MIN	MAX	Unit	Description
CSX	T _{CSS}	Chip select setup time (write)	15		ns	
	T _{CSH}	Chip select hold time (write)	15		ns	
	T _{CSS}	Chip select setup time (read)	60		ns	
	T _{SCC}	Chip select hold time (read)	65		ns	
	T _{CHW}	Chip select "H" pulse width	40		ns	
SCL	T _{SCYCW}	Serial clock cycle (Write)	16		ns	-write command & data ram
	T _{SHW}	SCL "H" pulse width (Write)	7		ns	
	T _{SLW}	SCL "L" pulse width (Write)	7		ns	
	T _{SCYCR}	Serial clock cycle (Read)	150		ns	-read command & data ram
	T _{SHR}	SCL "H" pulse width (Read)	60		ns	
	T _{SLR}	SCL "L" pulse width (Read)	60		ns	
D/CX	T _{DCS}	D/CX setup time	10		ns	
	T _{DCH}	D/CX hold time	10		ns	
SDA (DIN)	T _{SDS}	Data setup time	7		ns	
	T _{SDH}	Data hold time	7		ns	
DOUT	T _{ACC}	Access time	10	50	ns	For maximum CL=30pF
	T _{OH}	Output disable time	15	50	ns	For minimum CL=8pF

4-line serial Interface Characteristics



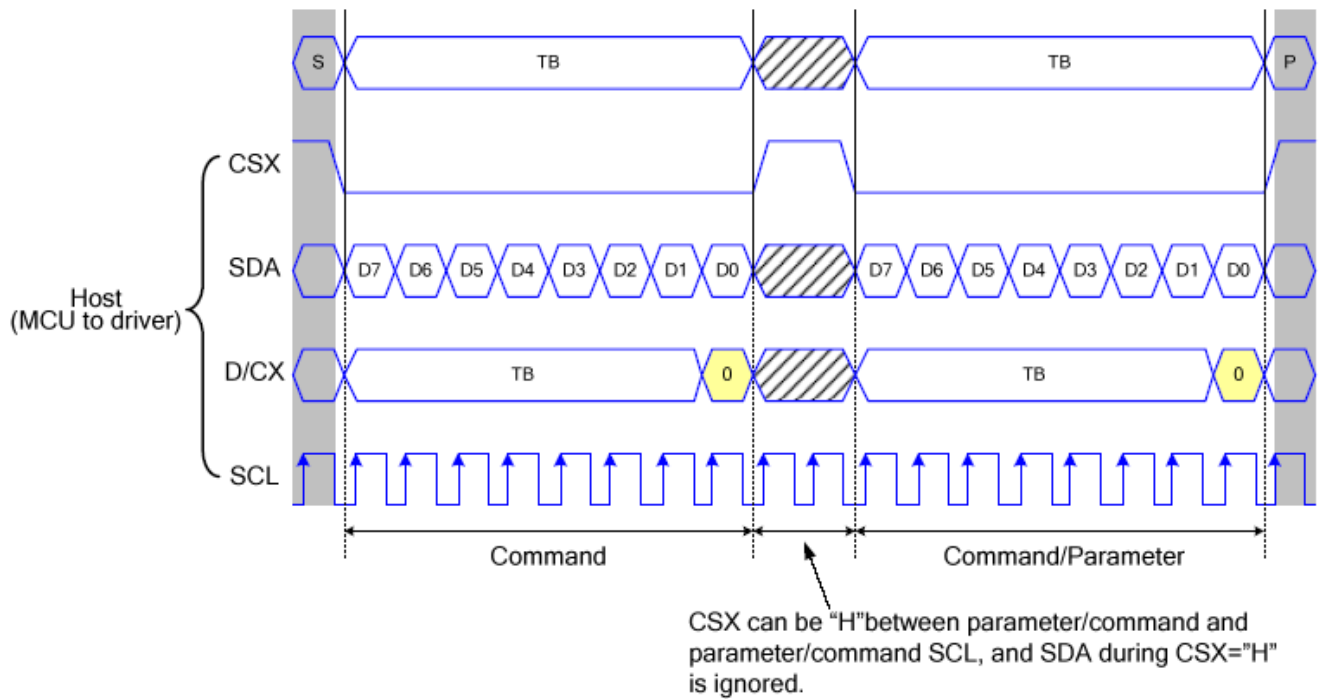
Reset Timing

VDDI=1.65 to 3.3V, VDD=2.4 to 3.3V, AGND=DGND=0V, Ta=-30 ~ 70 °C

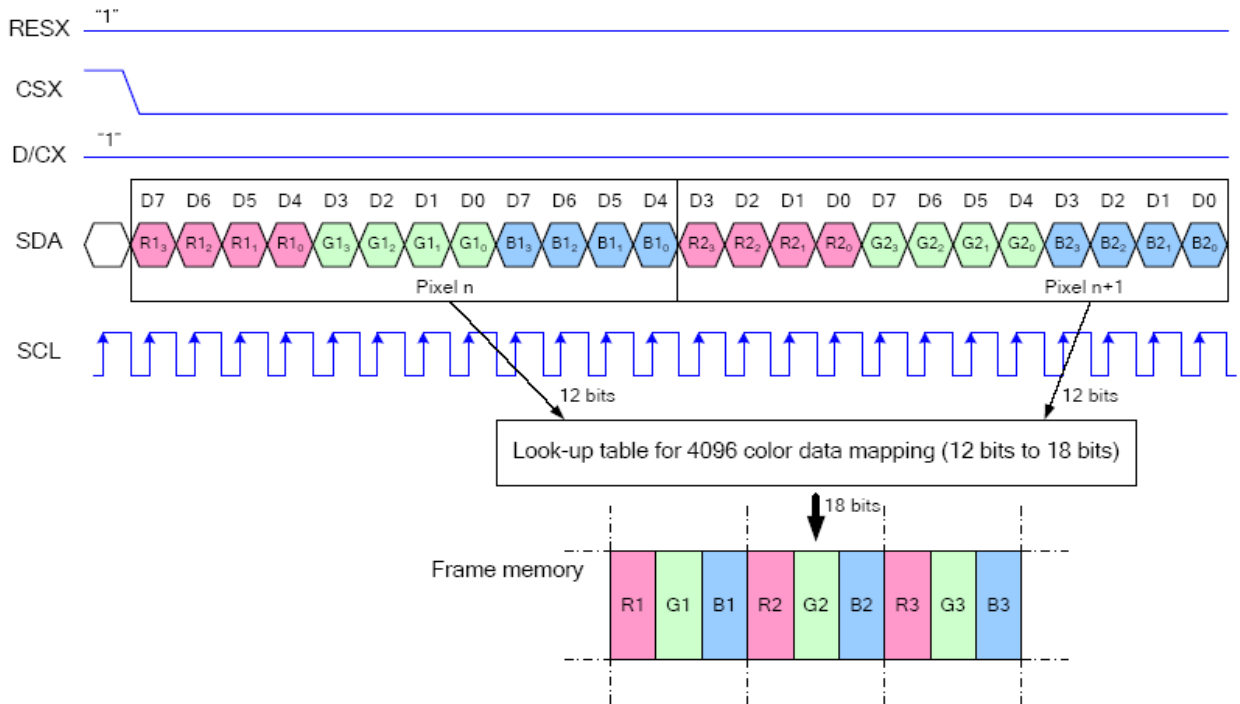
Related Pins	Symbol	Parameter	MIN	MAX	Unit
RESX	TRW	Reset pulse duration	10	-	us
	TRT	Reset cancel	-	5 (Note 1, 5)	ms
			120 (Note 1, 6, 7)	ms	

Reset Timing

7.2 Write data



7.2.1 Write data for 12-bit/pixel(RGB 4-4-4-bit input),4K-Colors,3Ah="03h"

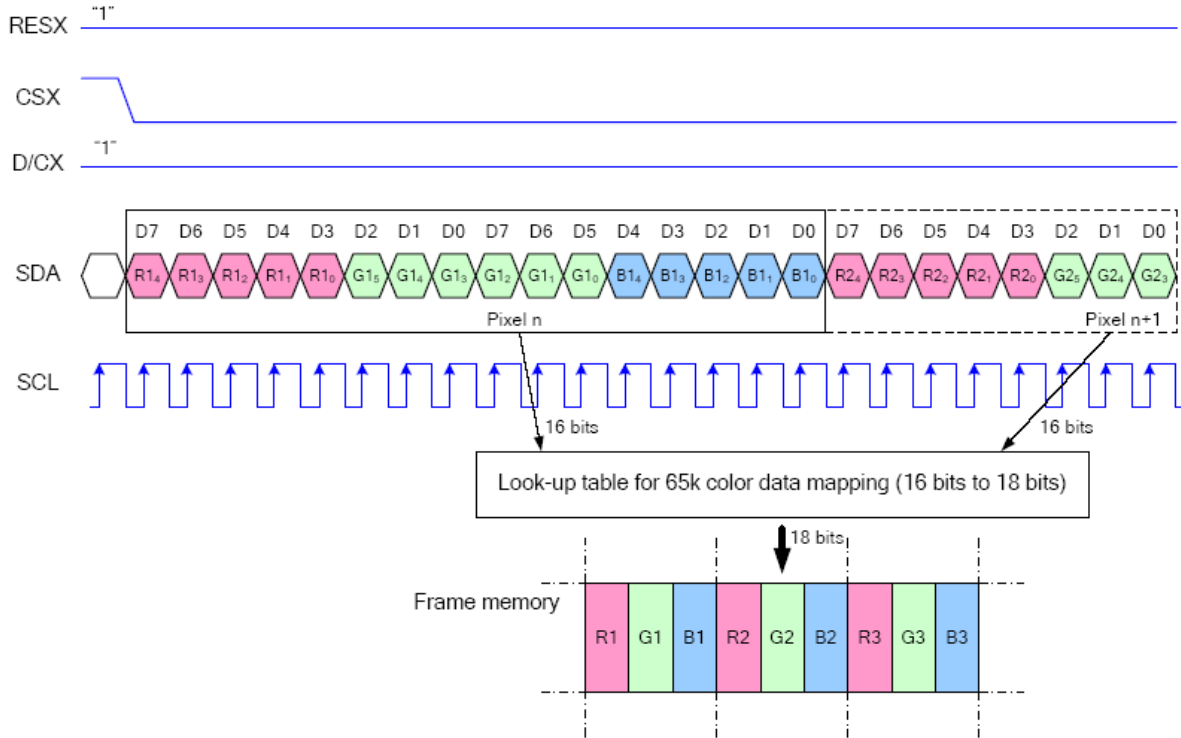


Note 1. pixel data with the 12-bit color depth information

Note 2. The most significant bits are: Rx3, Gx3 and Bx3

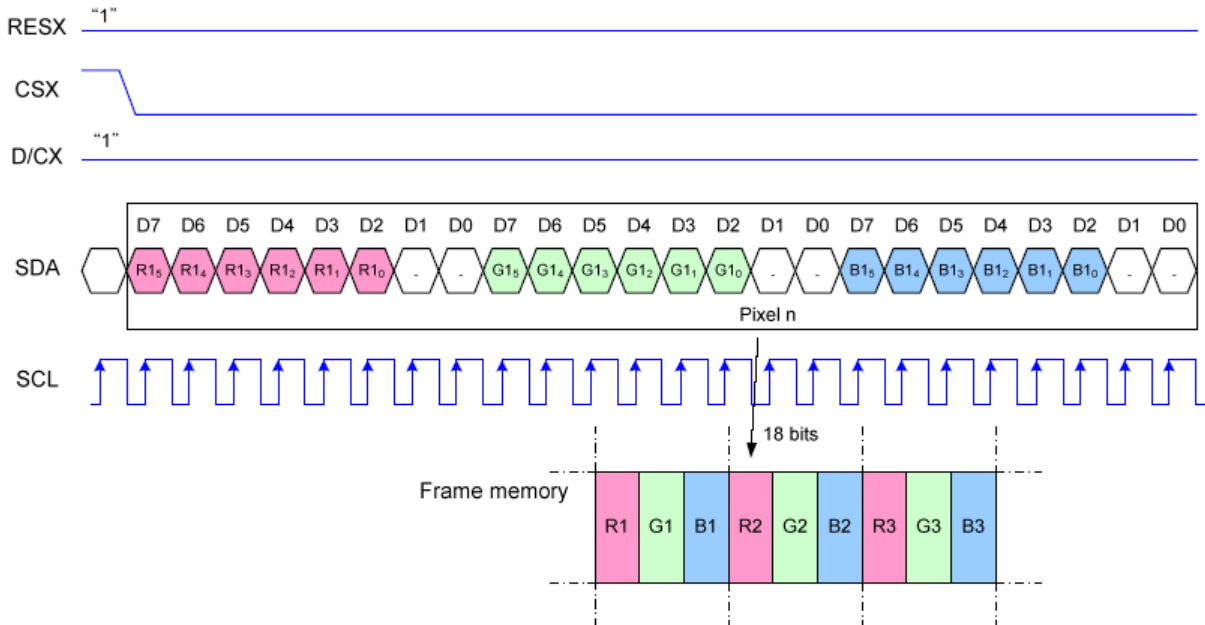
Note 3. The least significant bits are: Rx0, Gx0 and Bx0

7.2.2 Write data for 16-bit/pixel(RGB 5-6-5-bit input),65K-Colors,3Ah="05h"



- Note 1. pixel data with the 16-bit color depth information
- Note 2. The most significant bits are: Rx4, Gx5 and Bx4
- Note 3. The least significant bits are: Rx0, Gx0 and Bx0

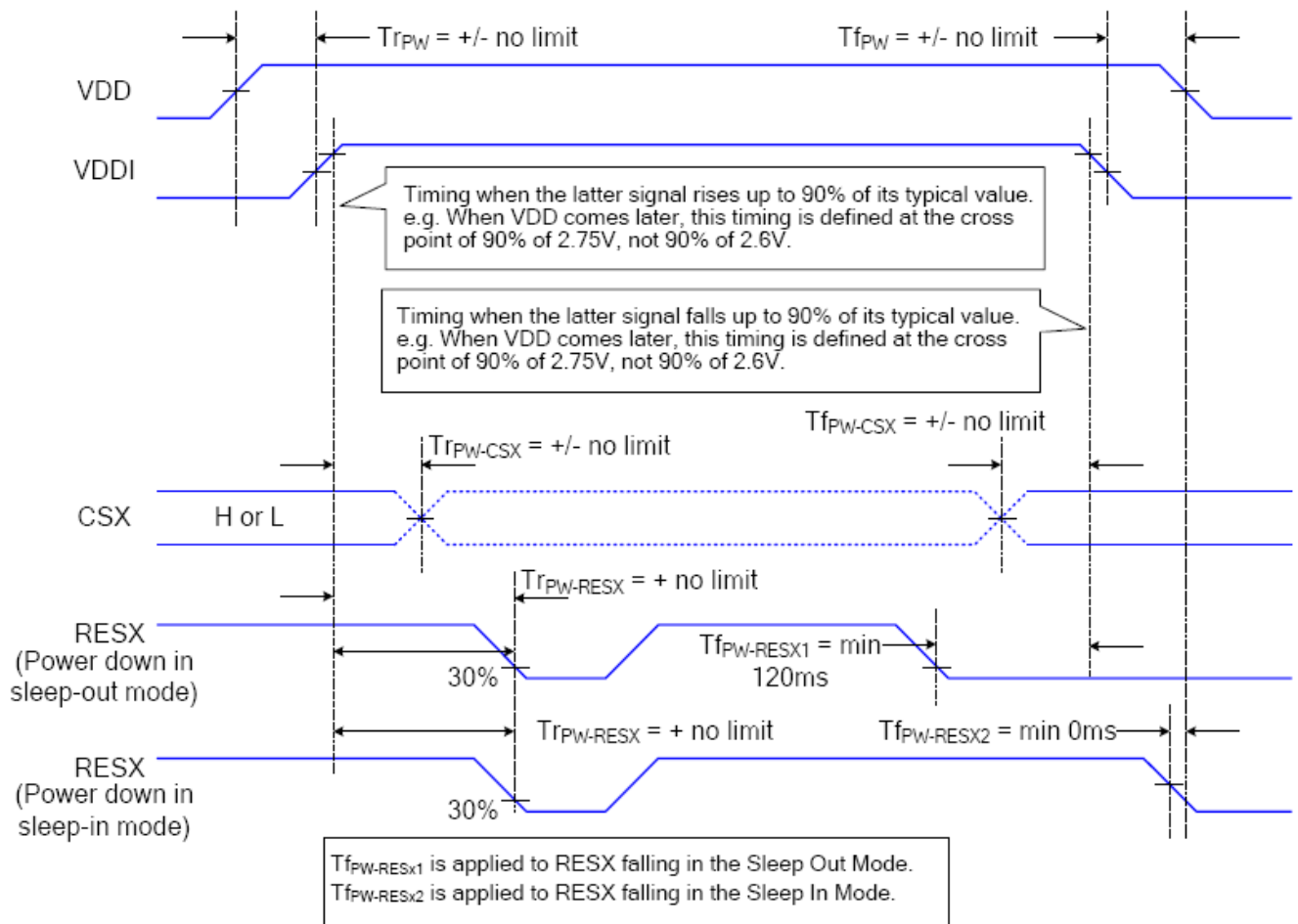
7.2.3 Write data for 18-bit/pixel(RGB 6-6-6-bit input),262K-Colors,3Ah="06h"



- Note 1. pixel data with the 18-bit color depth information
- Note 2. The most significant bits are: Rx5, Gx5 and Bx5
- Note 3. The least significant bits are: Rx0, Gx0 and Bx0

7.3 power on/off sequence

The power on/off sequence is illustrated below



8. Optical Specification

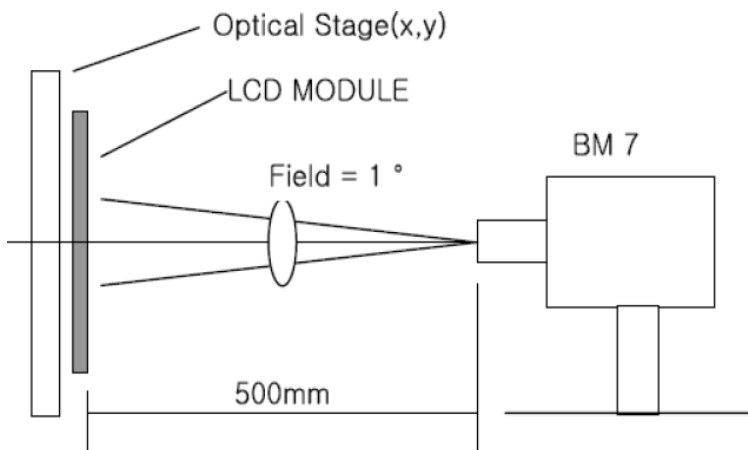
Ta=25°C

Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio	CR	$\theta=0^\circ$	300	500	-		Note1 Note2
Response Time	Ton/ Toff	25°C	-	35	-	ms	Note1 Note3
View Angles	θT	CR ≥ 10	-	50	-	Degree	Note 4
	θB		-	65	-		
	θL		-	65	-		
	θR		-	65	-		
Chromaticity	White	x	Brightness is on	Typ-0.02	Tpy+0.02		Note5, Note1
		y					
	RED	x					
		y					
	GREEN	x					
		y					
	BLUE	x					
		y					
NTSC	δL		-	45.6	-	%	Note5
Uniformity	U		-	80	-	%	Note1 Note6
Luminance	L		250	300	330	cd/m ²	Note1 Note7
Gamut				45.6		%	

Note 1: Definition of optical measurement system.

Temperature = 25°C (±3°C)

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

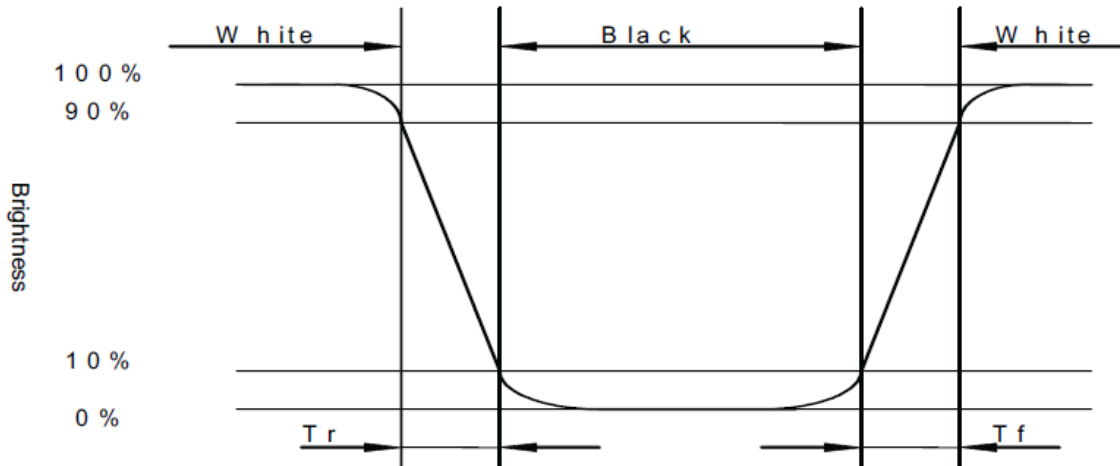


Note 2: Contrast ratio is defined as follow:

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

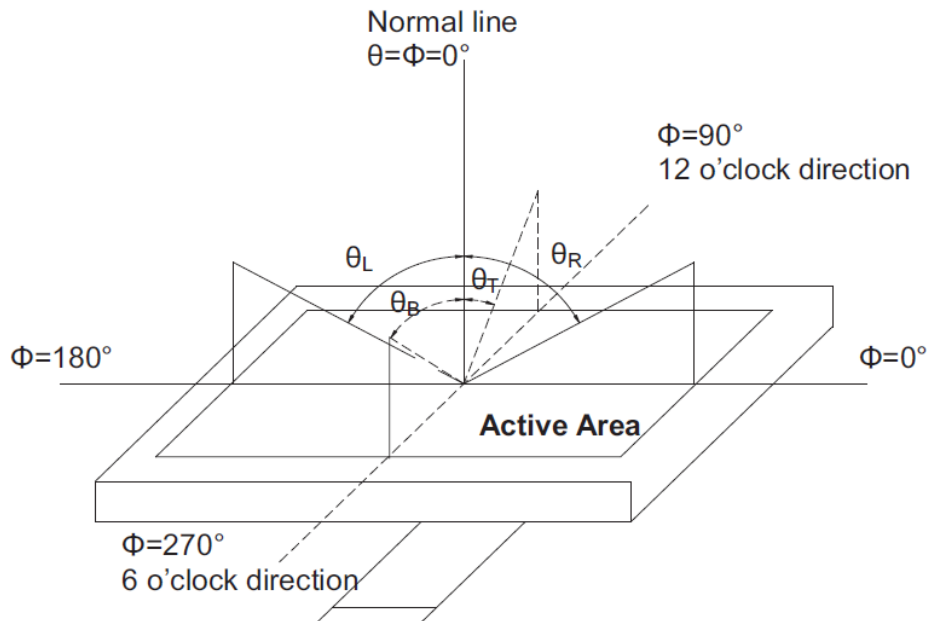
Note 3: Response time is defined as follow:

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).



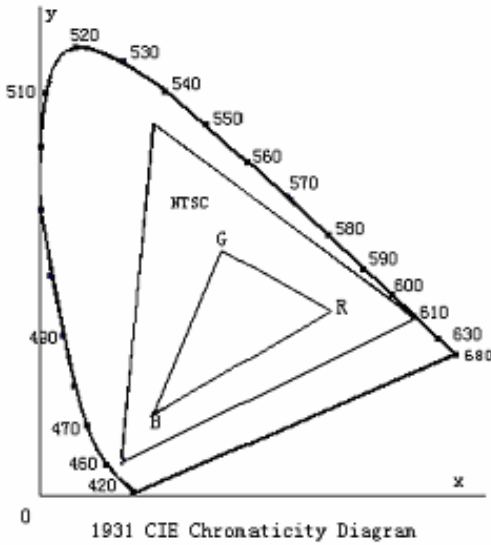
Note 4: Viewing angle range is defined as follow:

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.

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

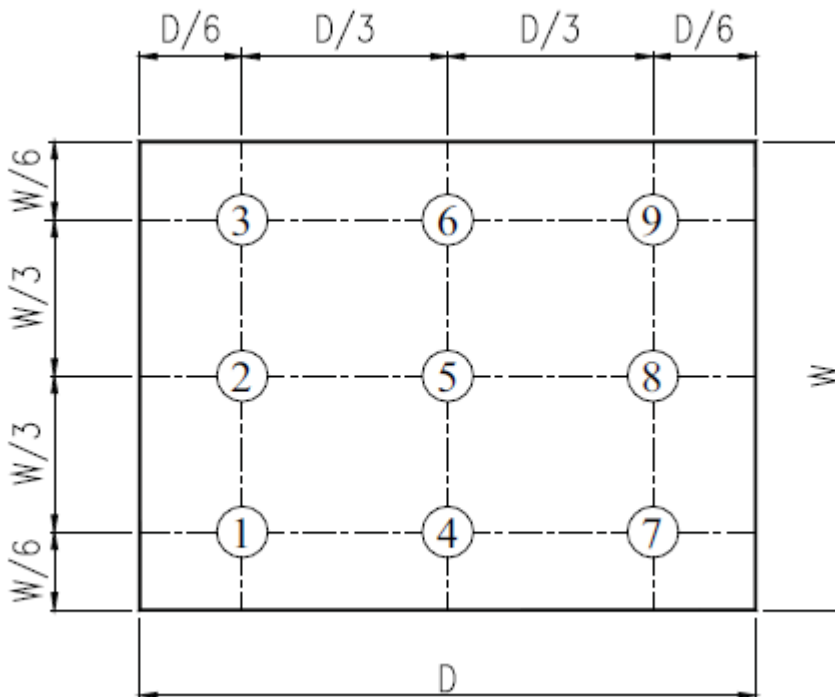


Fig. 2 Definition of uniformity

9. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Operation Temp	Ts=+70°C, 120hrs	Per table in below
2	Low Operation Temp	Ta=-20°C, 120hrs	Per table in below
3	High Temp Storage	Ta=+80°C, 120hrs	Per table in below
4	Low Temp Storage	Ta=-30°C, 120hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+40°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, 10 Cycles	Per table in below
7	ESD (Operation)	C=150pF, R=330Ω 5points/panel Air:±8KV, 5times; Contact:±4KV, 5 times;	Per table in below
8	Vibration (Non-operation)	Frequency range:10~55Hz, Stroke:1.5mm Sweep:10Hz~55Hz~10Hz hours for each direction of X.Y.Z.	2 Per table in below
9	Shock (Non-operation)	60G 6ms, ±X,±Y,±Z 3times, for each direction	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

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 $+25^{\circ}\text{C} \pm 10^{\circ}\text{C}$ 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.

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.

