DLC Display Co., Limited

德爾西顯示器有限公司

MODEL No:DLC0570BBM00RB-1

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Record of Revision

Date	Revision No.	Summary
2020-01-19	1.0	Rev 1.0 was issued

1. Scope

This data sheet is to introduce the specification of DLC0570BBM00RB-1 active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 5.7″ display area contains 640(RGB) x 480pixels.

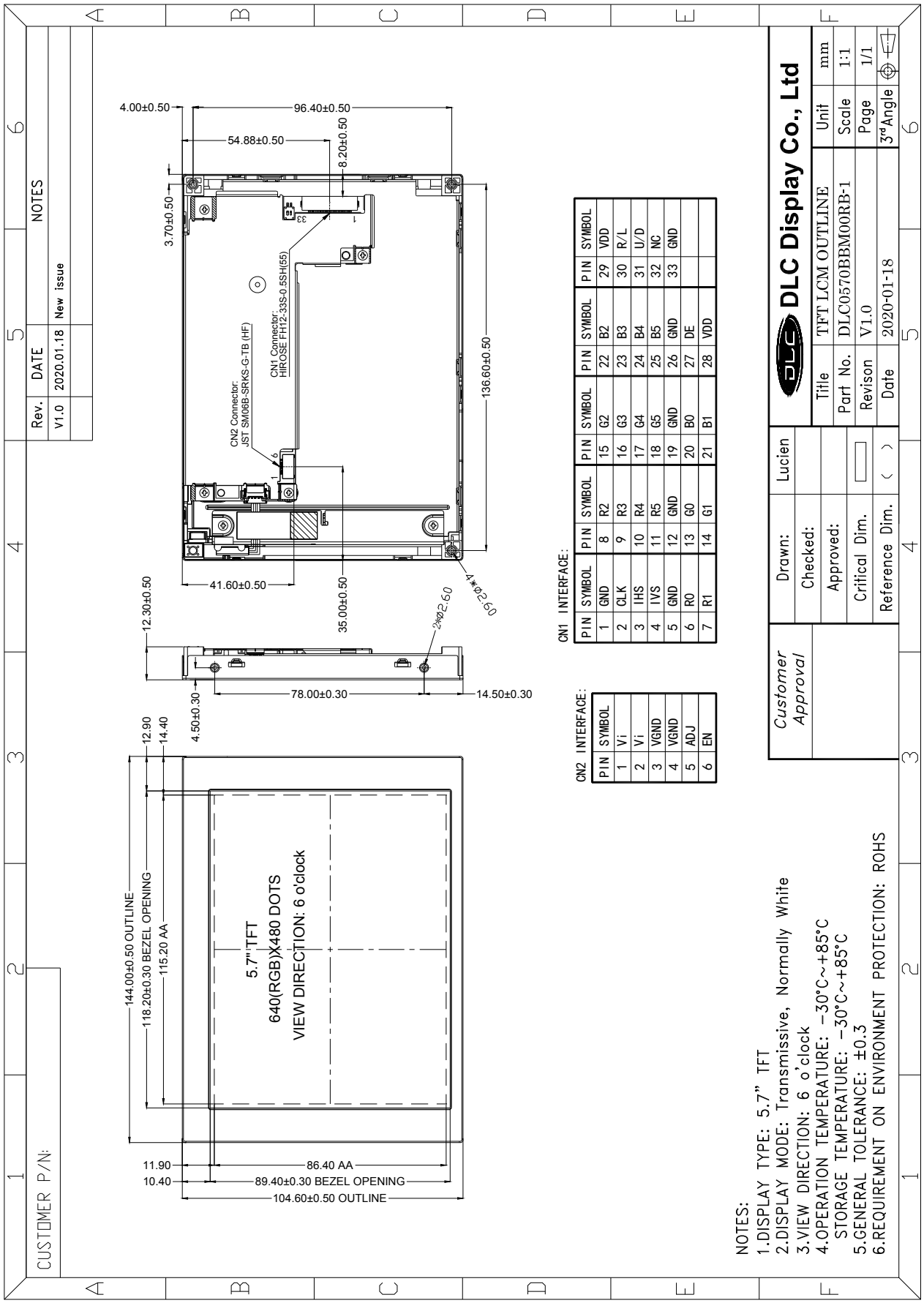
2. Application

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

3. General Information

Item	Contents	Unit
Size	5.70	inch
Resolution	640(RGB) x 480	/
Interface	RGB	/
Technology type	a-Si TFT	/
Pixel pitch	0.18 x 0.18	mm
Pixel Configuration	R.G.B. Vertical Stripe	
Outline Dimension (W x H x D)	144.00 x 104.60 x 12.30	mm
Active Area	115.20 x 86.40	mm
Display Mode	Transmissive, Normally white	/
Viewing Direction	6 o'clock	/
Backlight Type	White LED	/
Weight	155 (Typical)	g

4. Outline Drawing



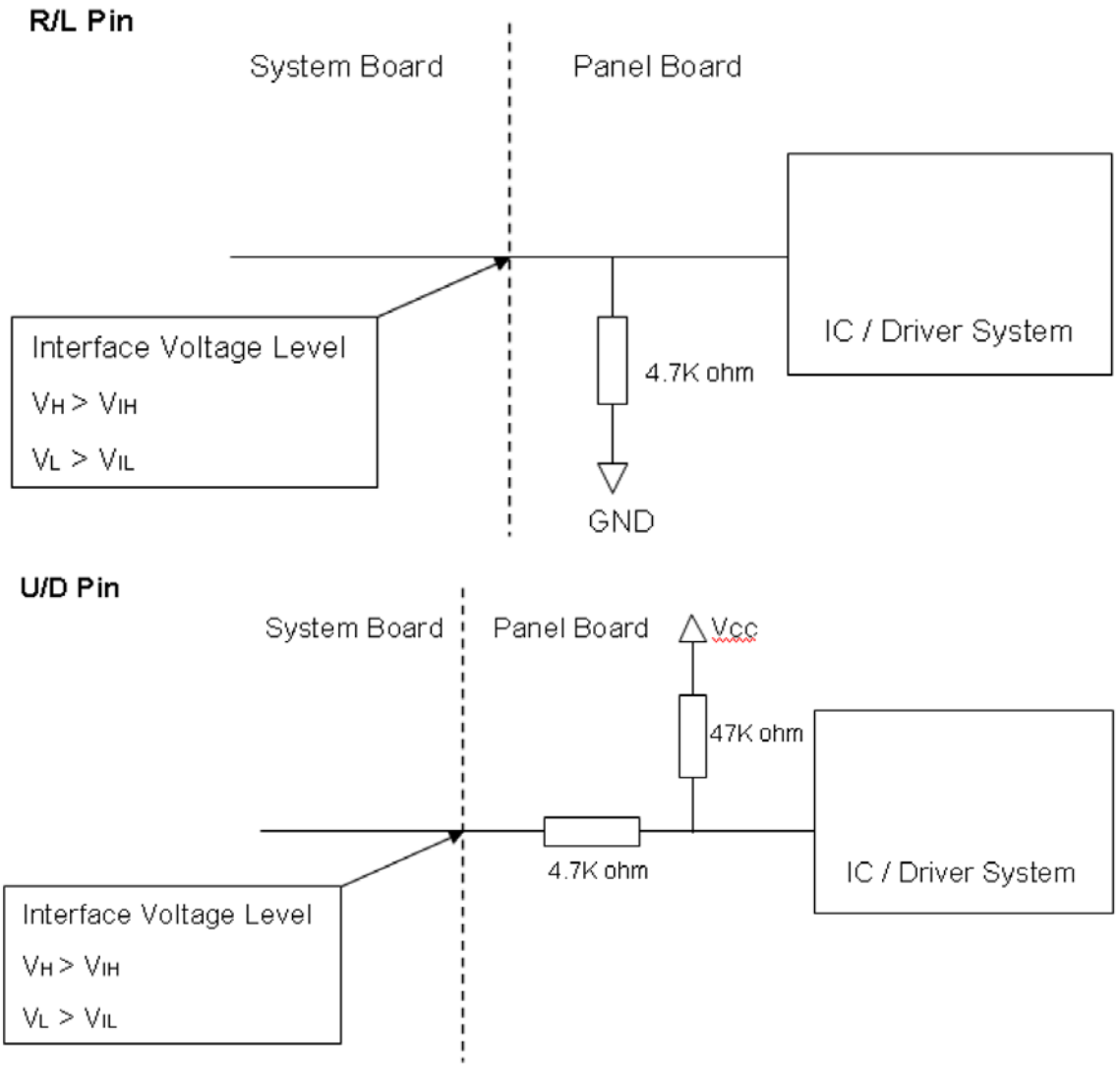
5. Interface signals

5.1 CN1 pin assignment (Signal interface)

No	Symbol	Description	Remarks
1	GND	Ground	
2	CLK	Dot clock.	
3	IHS	Horizontal synchronous signal	Note 4
4	IVS	Vertical synchronous signal	Note 4
5	GND	Ground	
6	R0	Red data (LSB)	
7	R1	Red data	
8	R2	Red data	
9	R3	Red data	
10	R4	Red data	
11	R5	Red data (MSB)	
12	GND	Ground	
13	G0	Green data(LSB)	
14	G1	Green data	
15	G2	Green data	
16	G3	Green data	
17	G4	Green data	
18	G5	Green data(MSB)	
19	GND	Ground	
20	B0	Blue data(LSB)	
21	B1	Blue data	
22	B2	Blue data	
23	B3	Blue data	
24	B4	Blue data	
25	B5	Blue data(MSB)	
26	GND	Ground	
27	DE	Data enable signal	
28	VDD	Power supply (3.3V)	
29	VDD	Power supply (3.3V)	
30	R/L	Horizontal reverse scan	Note 5
31	U/D	Vertical reverse scan	Note 5
32	NC	No connection	Note 3
33	GND	Ground	

Notes:

1. Connector Model Number: HIROSE FH12-33S-0.5SH(55) or equivalent.
2. “Low” stands for 0V. “High” stands for 3.3V. “NC” stands for “No connected”.
3. DE only Mode or DE + Sync Mode
4. a. DIP Switch for Two types or four types reverse scan Option.
   b. Interface optional pin has internal scheme as following diagram, Customer should keep the interface voltage level requirement which including panel board loading as below.

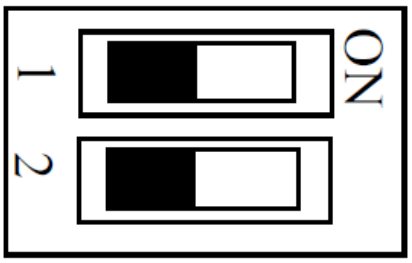


5.2 CN2 pin assignment (Backlight interface)

No	Symbol	Description	Remarks
1	V_i	Converter input voltage	12V
2	V_i	Converter input voltage	12V
2	VGND	Converter Ground	Ground
4	VGND	Converter Ground	Ground
5	ADJ	Backlight Adjust	PWM Dimming
6	EN	Backlight enable	LED On/Off

Note: Connector Model Number: SM06B-SRKS-G-TB (HF)(JST)

5.3 DIP Switch for Reverse Scan function option



(1). Switch 1

ON: NA
OFF: NA

(2). Switch 2

ON：2 types reverse scan as the Fig.5 & Fig.6 (U/D must be “OPEN”)
OFF：4 types reverse scan as the Fig.1~4

The following figures show the image see from the front view. The arrow indicates the direction of scan.

Fig.1 Normal Scan

Fig.2 Reverse scan

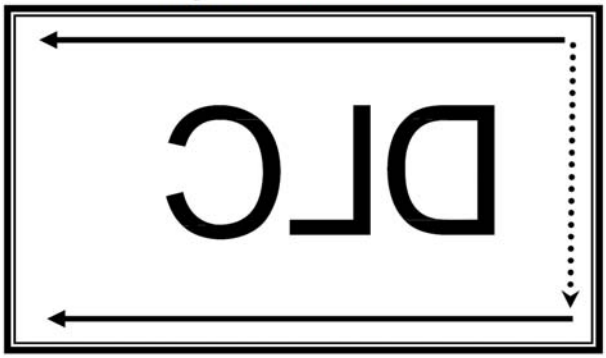


Fig.3 Reverse scan

Fig.4 Reverse scan

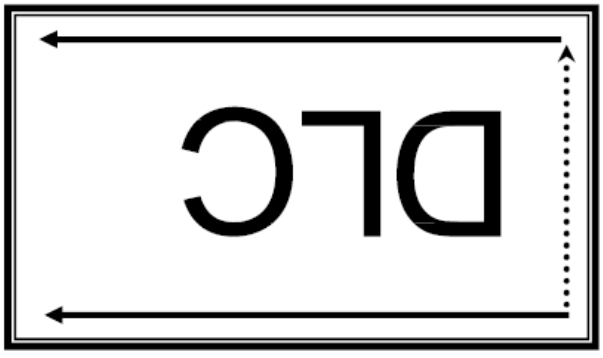


Fig. 1 Normal scan (R/L=Low or NC, U/D = High or NC)
Fig. 2 Reverse scan (R/L=High, U/D = High or NC)
Fig. 3 Reverse scan (R/L=Low or NC, U/D = Low)
Fig. 4 Reverse scan (R/L=High, U/D = Low)

The following figures show the image see from the front view. The arrow indicates the direction of scan.

Fig.5 Normal Scan

Fig.6 Reverse Scan

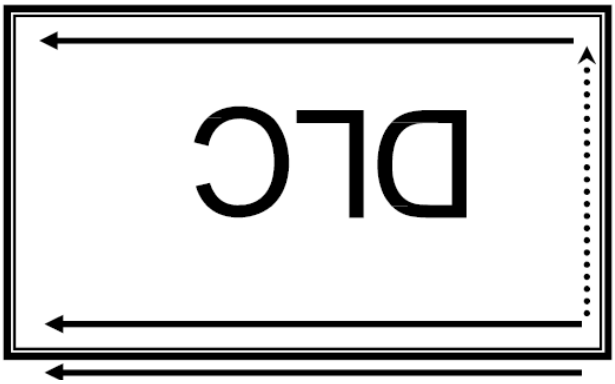


Fig. 5 Normal scan (RL=Low or NC)

Fig. 6 Reverse scan (RL=High)

6. Absolute maximum Ratings

6.1. Electrical Absolute max. ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Power voltage	VCC	-0.3	3.6	V	Note 1
Converter voltage	Vi	-0.3	18	V	Note 1,2
Enable voltage	EN	-	5.5	V	
Backlight adjust	ADJ	-	5.5	V	

Notes:

1. Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.
2. Specified values are for lamp (Refer to 3.2 for further information).

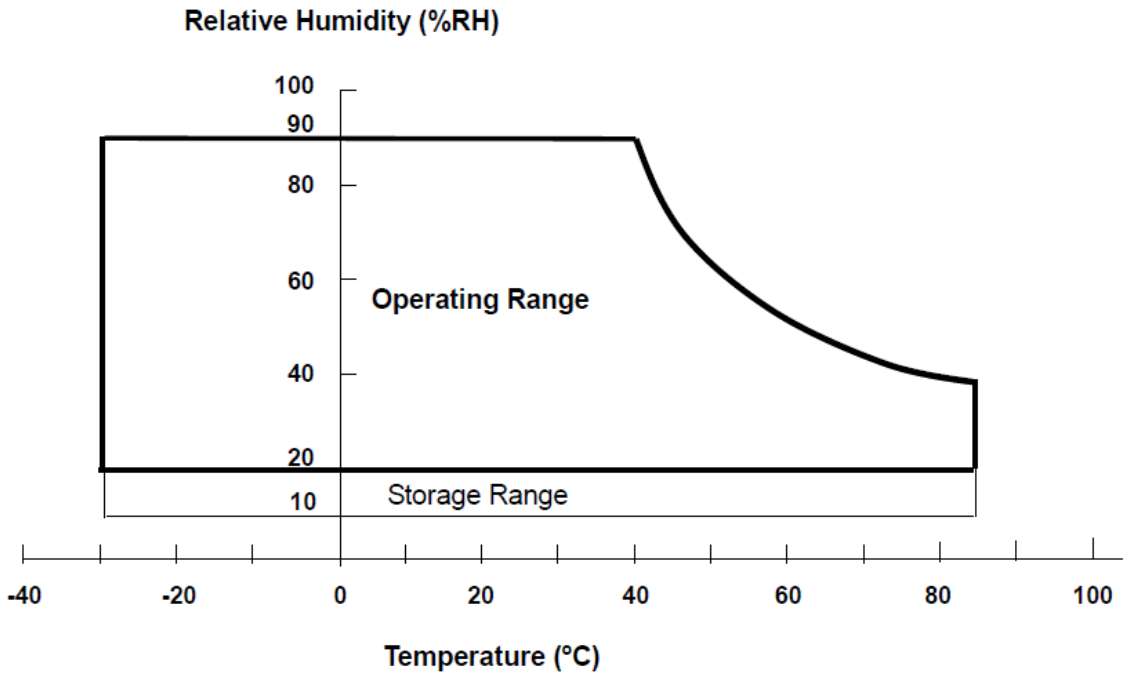
6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-30	85	℃	
Storage Temperature	TSTG	-30	85	℃	

Notes:

1. Temperature and relative humidity range is shown in the figure below.
2. 90%RH Max. (Ta < 40 ºC).

3. Wet-bulb temperature should be 39 ºC Max. (Ta < 40 ºC).
4. No condensation.



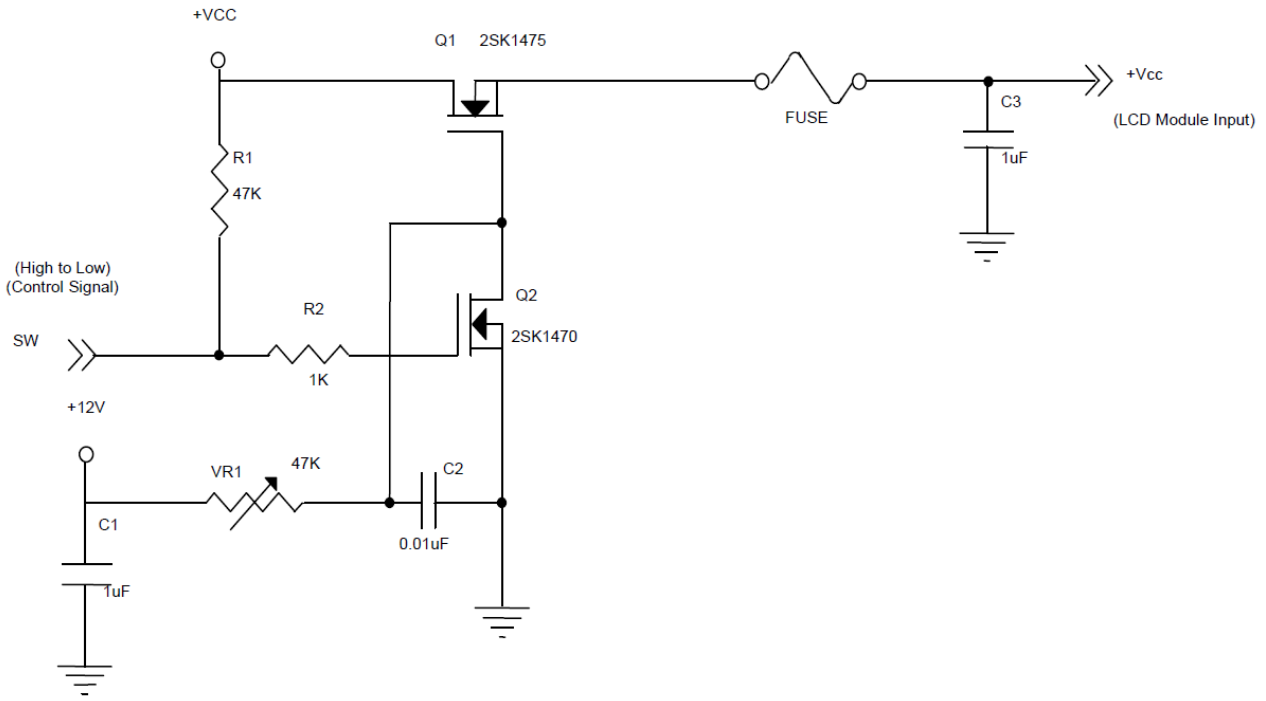
7. Electrical Specifications

7.1 Electrical characteristics

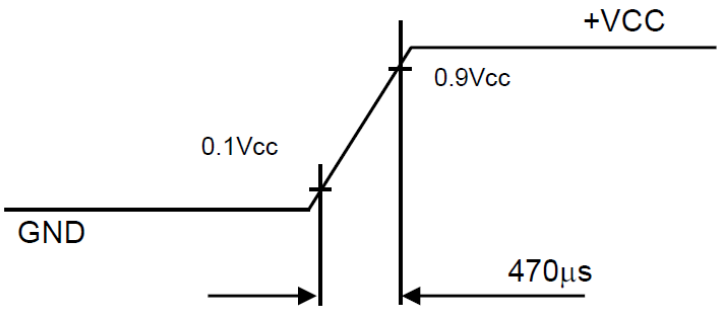
GND=0V, Ta=25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Power supply voltage		VCC	3.0	3.3	3.6	V	Note 1 at VCC=3.3V
Rush Current		IRUSH	-	-	1.5	A	Note 2
Power supply current	White	--	-	140	190	mA	Note 3 a, at VCC=3.3V
	Black	--	-	160	210	mA	Note 3 b, at VCC=3.3V
Power consumption		PL	-			W	
Logic high input voltage		VIH	0.7*VCC	-	VCC	V	
Logic low input voltage		VIL	GND	-	0.3*VCC	V	

Notes:
1. The assembly should be always operated within above ranges.
2. Measurement Conditions:



Vcc rising time is 470μs



3. The specified power supply current is under the conditions at VCC = 3.3V, Ta = 25 ± 2 ºC, fv = 60 Hz, whereas a power dissipation check pattern below is displayed.

a. White Pattern

Active Area

b. Black Pattern

Active Area

7.2 LED Backlight

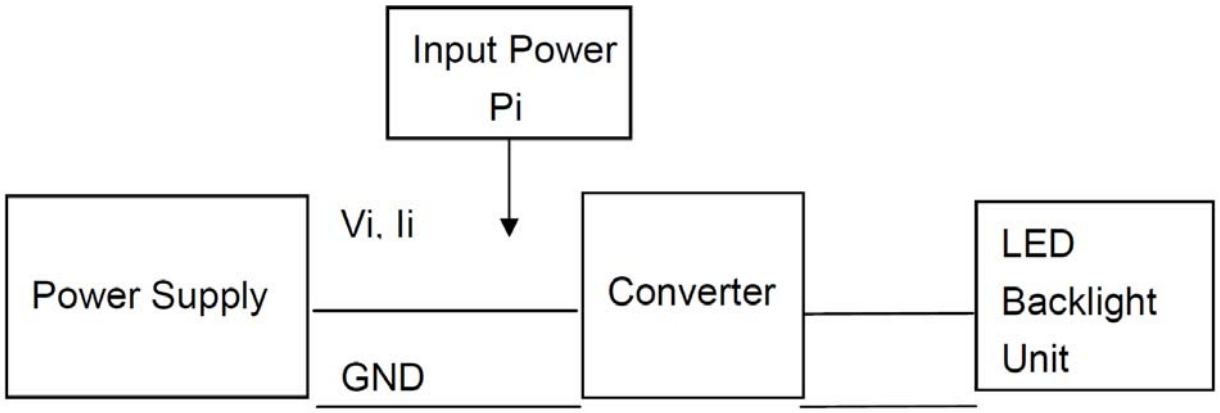
Ta=25℃

Item		Symbol	MIN	TYP	MAX	Unit	Remark
Converter power supply voltage		Vi	10.8	12	13.2	V	
Converter power supply current		Ii	0.23	0.26	0.28	A	@Vi=12V (Duty 100%)
LED power consumption		Po	-	2.45	-	W	@Vi=12V (Duty 100%)
EN control level	Backlight on	-	2.0	3.3	5.0	V	
	Backlight off	-	0	-	0.15	V	
PWM control level	PWM high level	-	2.0	3.3	5.0	V	
	PWM low level	-	0	-	0.15	V	
PWM control duty ratio		-	Note3	-	100	%	Note 3
PWM control frequency		f_{PWM}	200	-	30,000	Hz	Note 3
LED life time		-	50,000	-	-	Hrs	Note 2

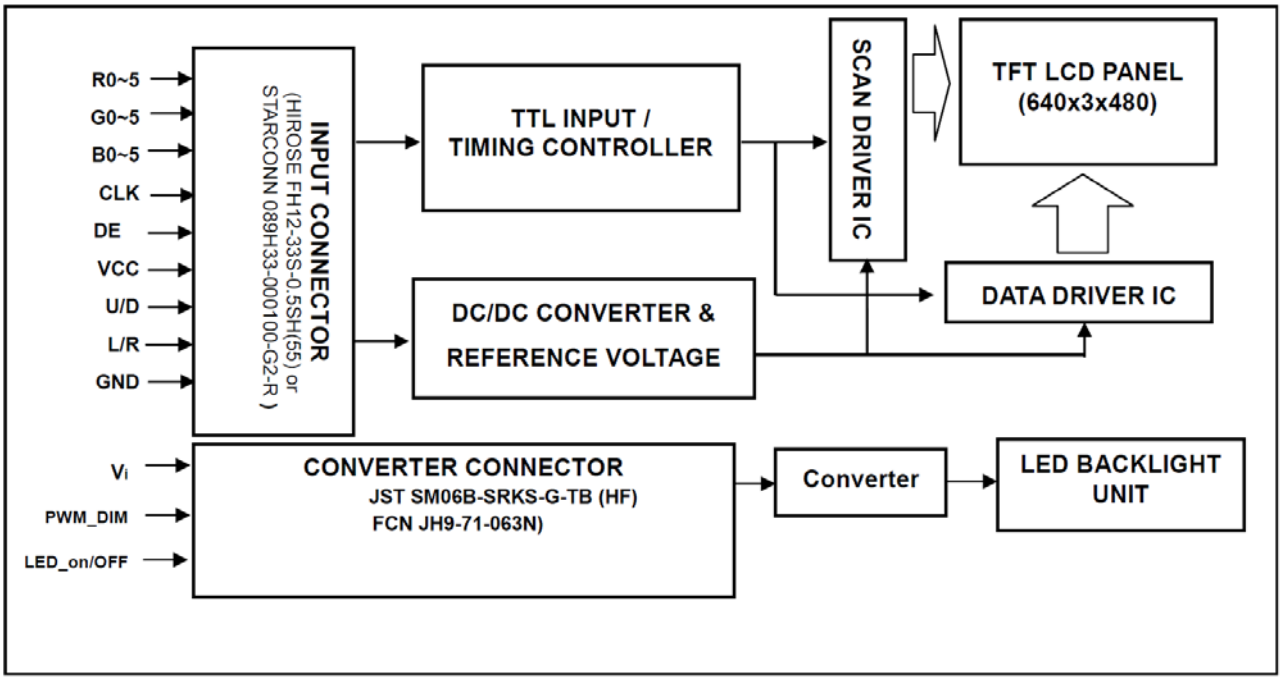
Notes:

1. LED current is measured by utilizing a high frequency current meter as shown below:
2. The lifetime of LED is defined as the time when it continues to operate under the conditions at Ta = 25 ±2 ℃ and Duty 100% until the brightness becomes ≦ 50% of its original value. Operating LED under high temperature environment will reduce life time and lead to color shift.
3. At 1K ~30KHz PWM control frequency, duty ratio range is restricted as below:

   1K Hz ===> 2 %
   10KHz ===> 20 %
   20KHz ===> 40 %
   30KHz ===> 60 %



7.3 Block Diagram



8. Command/AC Timing

8.1 Input Signal Timing Specifications

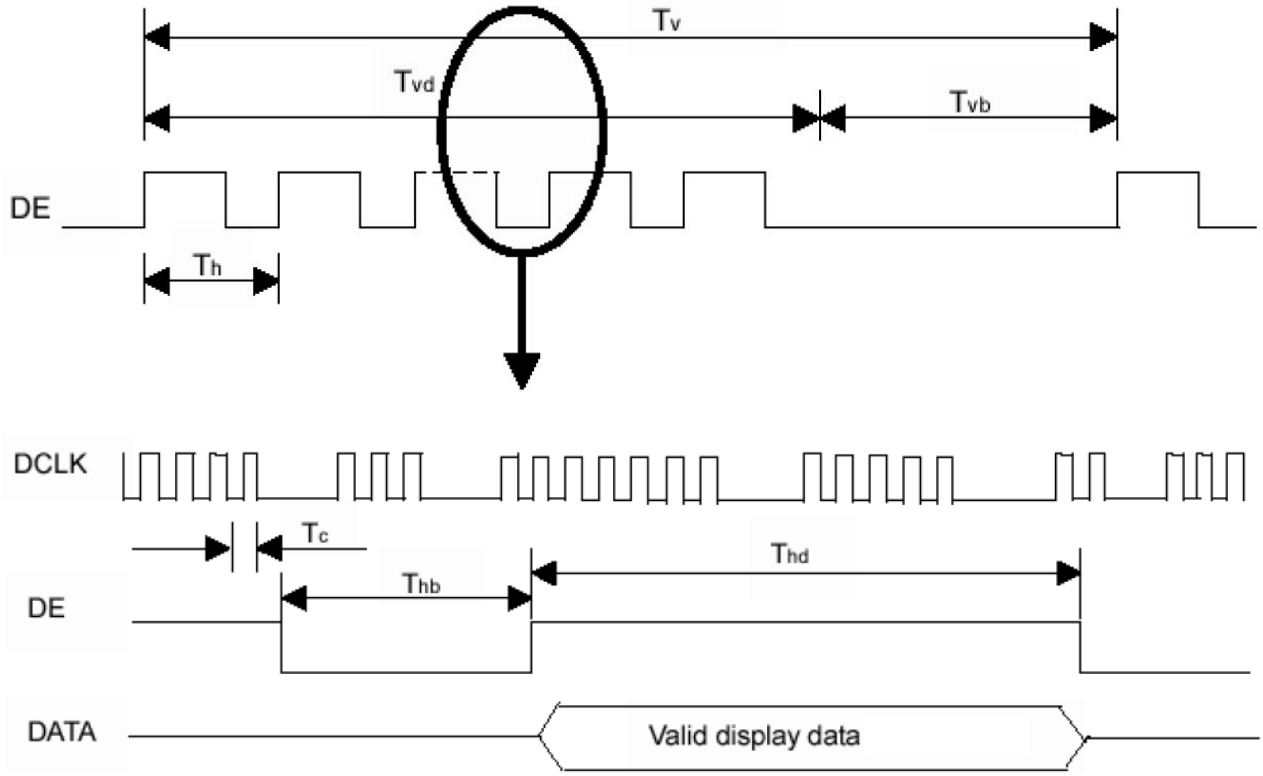
The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	MIN	TYP	MAX	Unit	Note
DCLK	Frequency	fc	22.66	25.175	27.69	MHz	
Vertical active display term	Total	tv	515	525	535	Th	tv=tvd+tvb
	Display	tvd	-	480	-	Th	
	Blank	tvb	35	45	55	Th	
Horizontal active display term	Total	th	750	800	850	Tc	t=thd+thb
	Display	thd	-	640	-	Tc	
	Blank	thb	110	160	210	Tc	

Notes:

1. Since this assembly is operated in DE only mode. Otherwise, this assembly would operate abnormally.
2. Frame rate is 60Hz.

INPUT SIGNAL TIMING DIAGRAM



8.2 DE + Sync Mode Input Signal Timing Specifications

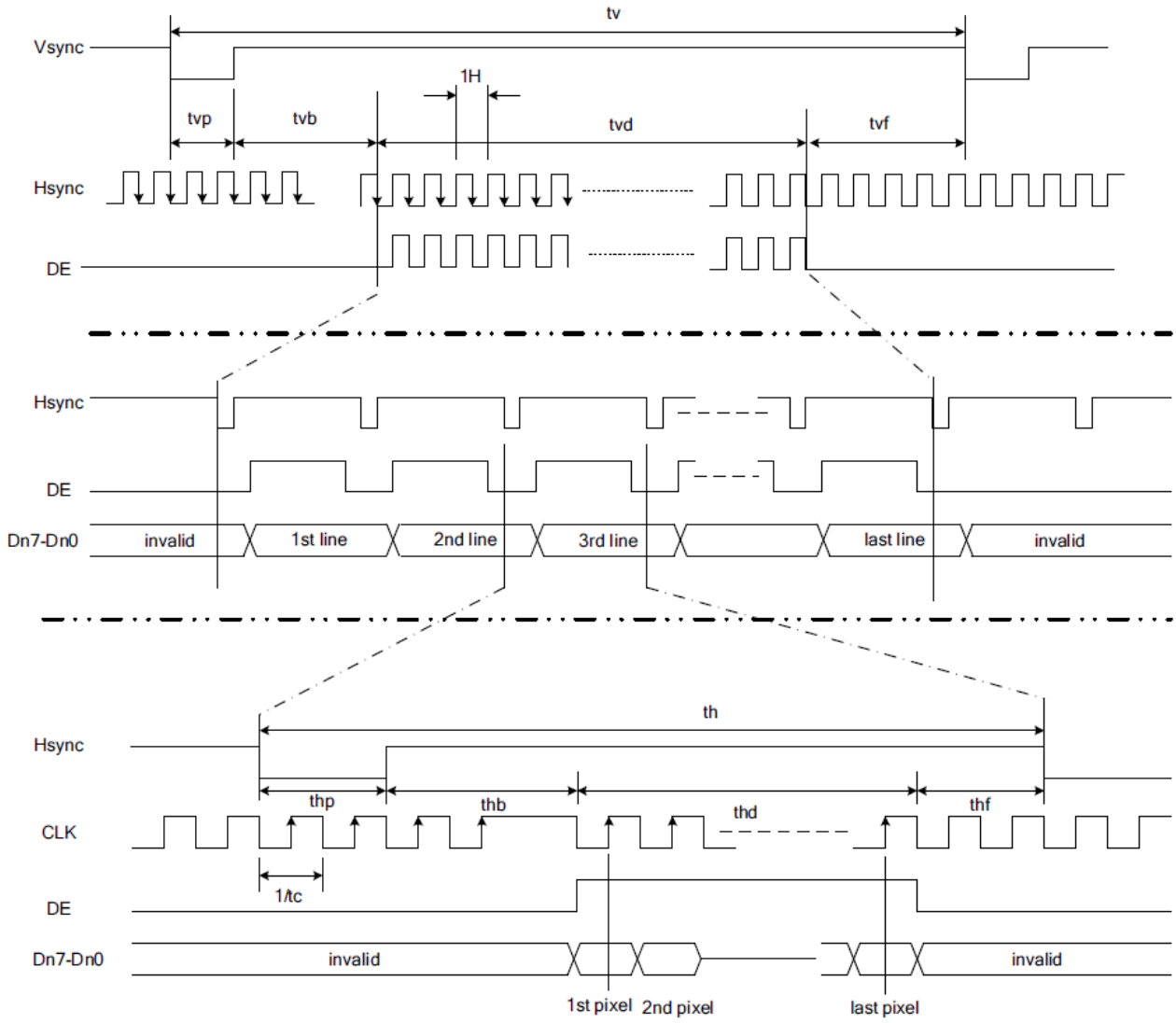
The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	MIN	TYP	MAX	Unit	Note
DCLK	Frequency	fc	22.66	25.175	27.69	MHz	
Vertical active display term	Total	tv	515	525	535	Th	
	Display	tvd	-	480	-	Th	
	Front porch	tvf	-	7	-	Th	
	Blank porch	tvb	-	35	-	Th	
	VS pulse width	tvp	1	3	5	Th	
Horizontal active display term	Total	th	750	800	850	Tc	
	Display	thd	-	640	-	Tc	
	Front porch	thf	-	16	-	Tc	
	Blank porch	thb	107	114	125	Tc	
	HS pulse width	thp	5	20	50	Tc	

Notes:

1. Since this assembly is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this assembly would operate abnormally.
2. Frame rate is 60Hz

INPUT SIGNAL TIMING DIAGRAM



8.3 Color Data Input Assignment

The brightness of each primary color (red, green and blue) is based on the 6-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of color versus data input.

Color		Data Signal																	
		Red						Green						Blue					
		R5	R4	R3	R2	R1	R0	G5	G4	G3	G2	G1	G0	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	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
Gray Scale Of Red	Red(0)/Dark	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	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(2)	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red(61)	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
	Red(62)	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red(63)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green(0)/Dark	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	1	0	0	0	0	0	0
	Green(2)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
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	Green(61)	0	0	0	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0
	Green(62)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
	Green(63)	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0
Gray Scale Of Blue	Blue(0)/Dark	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	1
	Blue(2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
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	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue(61)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1
	Blue(62)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0
	Blue(63)	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

8.4 Power ON/OFF Sequence

To prevent a latch-up or DC operation of LCD assembly, the power on/off sequence should be as the diagram below.

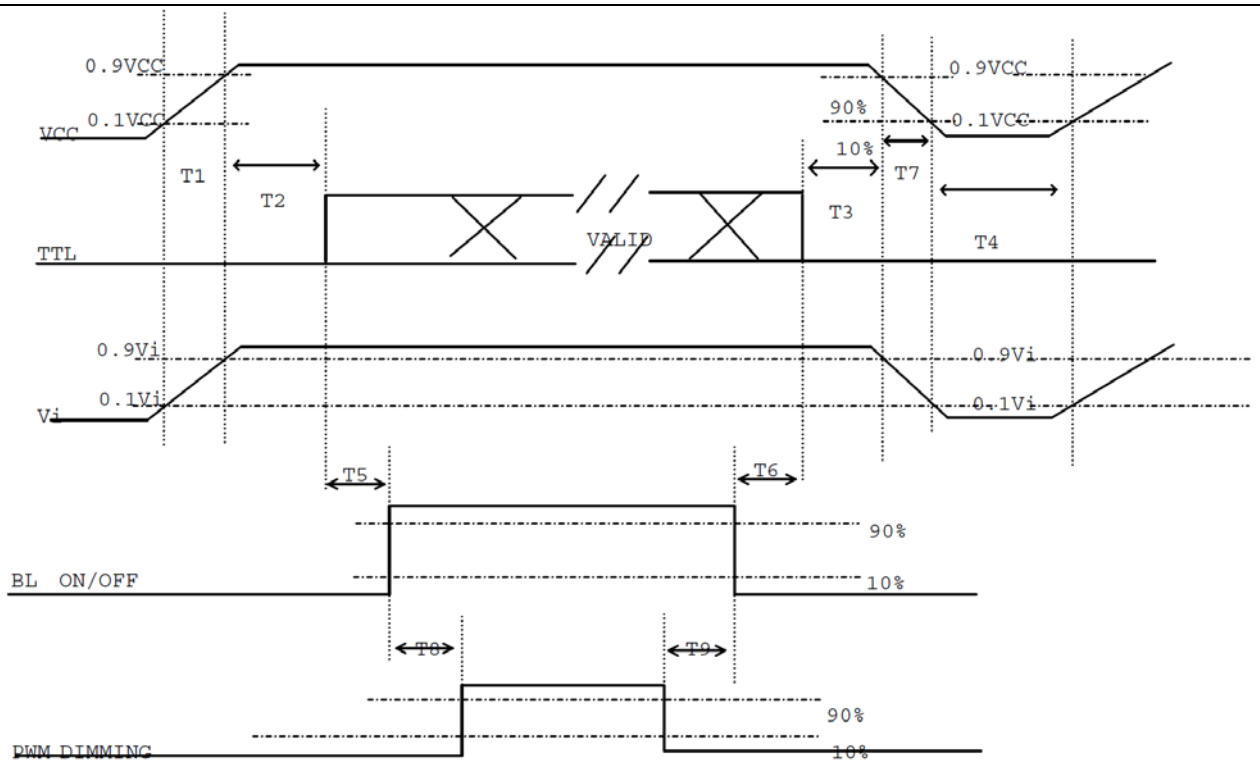


Fig. Power ON/OFF sequence

Notes:

1. Please avoid floating state of interface signal at invalid period.
2. When the interface signal is invalid, be sure to pull down the power supply of LCD VCC to 0 V.
3. The Backlight converter power must be turned on after the power supply for the logic and the interface signal is valid. The Backlight converter power must be turned off before the power supply for the logic and the interface signal is invalid.

Parameter	Min.	Typ.	Max.	Units
T1	0.5	-	10	ms
T2	0	-	50	ms
T3	0	-	50	ms
T4	500	-	-	ms
T5	200	-	-	ms
T6	200	-	-	ms
T7	5	-	300	ms
T8	10	-	-	ms
T9	10	-	-	ms

9. Optical Specification

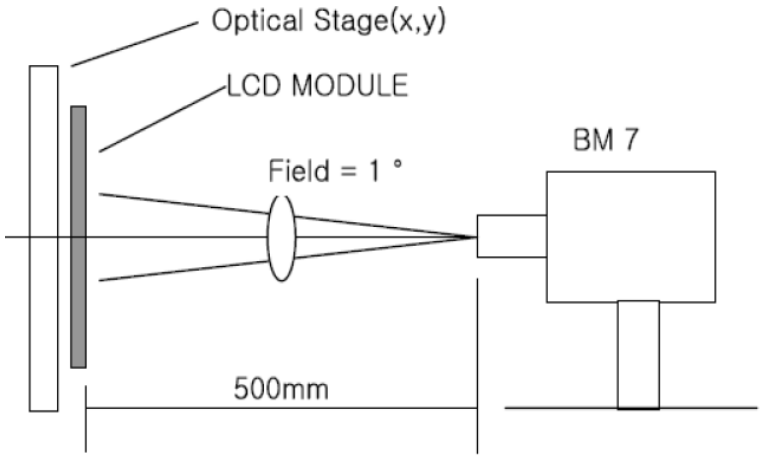
Ta=25℃

Item		Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio		CR	θ=0°	600	800	-		Note1 Note2
Response Time		Tr	25℃	-	15	-	ms	Note1 Note3
		Tf		-	35	-	ms	
View Angles		ΘT	CR≧10	60	70	-	Degree	Note 4
		ΘB		60	70	-		
		ΘL		70	80	-		
		θR		70	80	-		
Chromaticity	White	x	Brightness is on	Typ-0.05	0.313	Tpy+0.05		Note5, Note1
		y			0.329			
	RED	x			0.588			
		y			0.339			
	GREEN	x			0.332			
		y			0.587			
	BLUE	x			0.146			
		y			0.097			
Luminance		L		350	450	-	cd/m2	Note1 Note6
Uniformity		U		75	80	-	%	Note1 Note7

Note 1: Definition of optical measurement system.

Temperature = 25℃(±3℃)

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

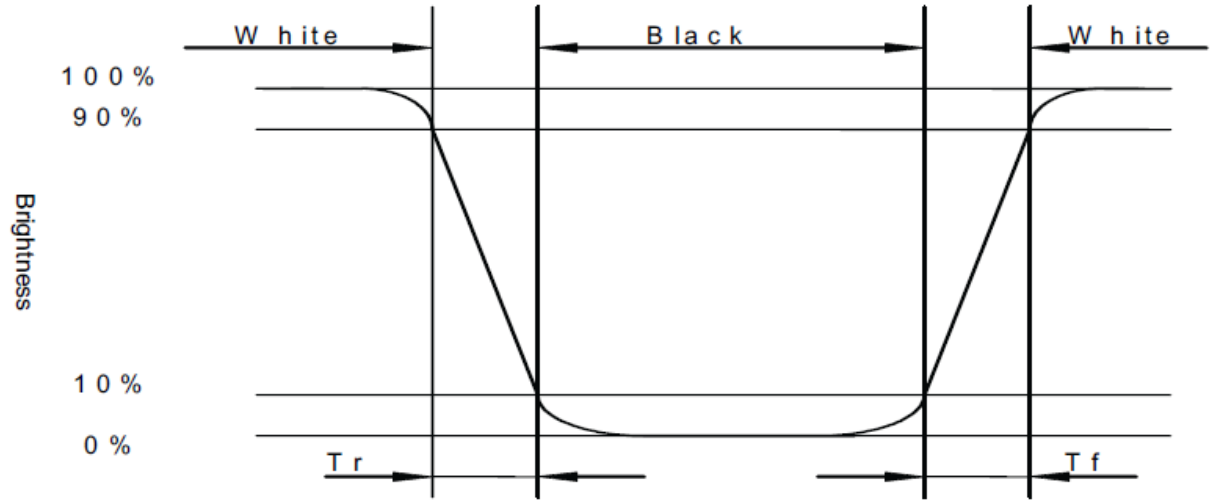


Note 2: Contrast ratio is defined as follow:

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

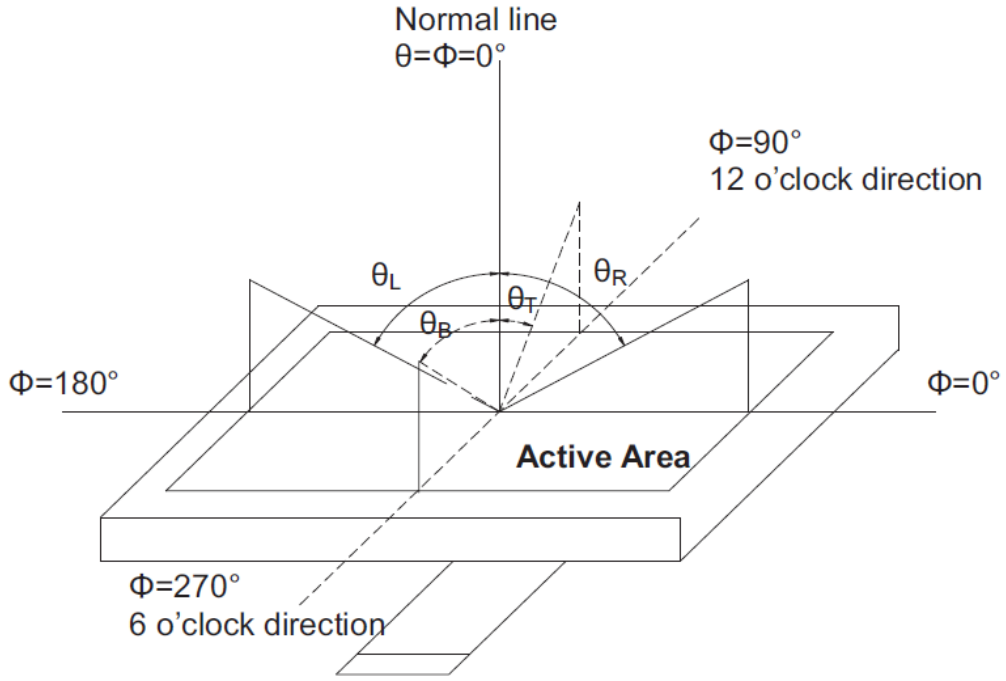
Note 3: Response time is defined as follow:

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).



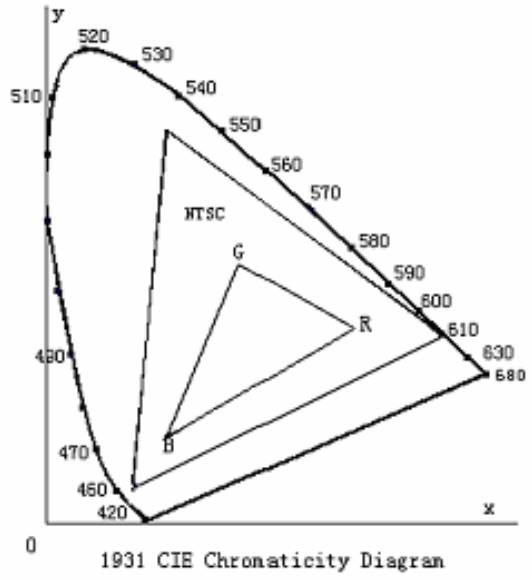
Note 4: Viewing angle range is defined as follow:

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 Diagran

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

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.

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

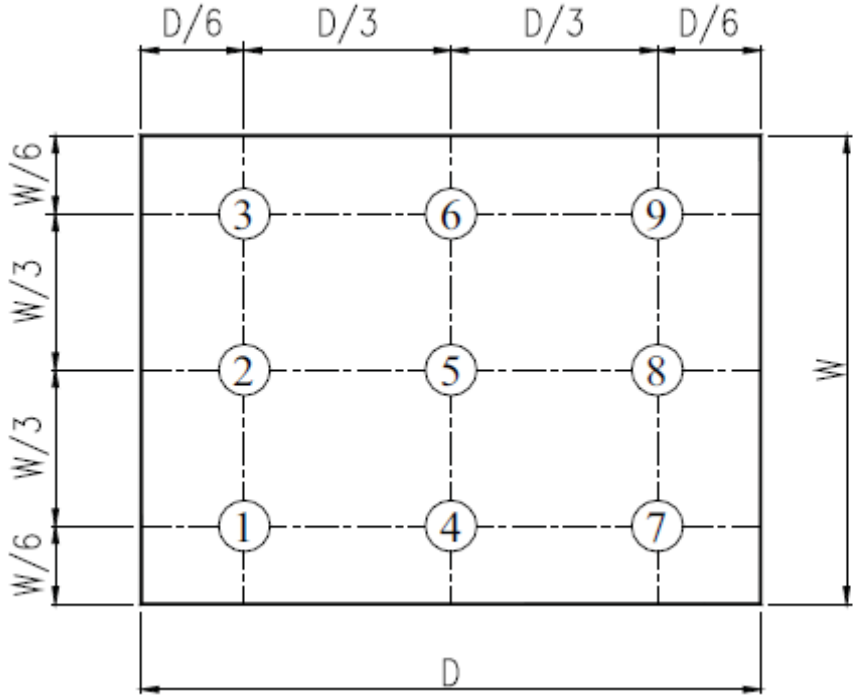


Fig. 2 Definition of uniformity

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ta= +85℃, 240hrs	Per table in below
2	Low Temp Operation	Ta= -30℃,240hrs	Per table in below
3	High Temp Storage	Ta= +85℃,240hrs	Per table in below
4	Low Temp Storage	Ta= -30℃, 240hrs	Per table in below
5	High Temp & High Humidity Storage	Ta= +60℃, 90% RH, 240 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30℃ 30 min~+85℃ 30 min, Change time:5min, 100 Cycles	Per table in below
7	ESD (Operation)	C=150pF, R=330Ω，5points/panel Air:±15KV, 5times; Contact:±8KV, 5 times;	Per table in below
8	Vibration (Non-operation)	Sine wave： 1.5G, 10~200~10Hz/Sine wave, 30mins/axis.	Per table in below
9	Shock (Non-operation)	50G,20ms,Half-sine wave, (±X, ±Y, ±Z)	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.

11.4Storage

A. Store the products in a dark place at +25℃±10℃ 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

A. 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.
B. 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.
C. Do not display the fixed pattern for a long time because it may develop image sticking due to the LCD structure. If the screen is displayed with fixed pattern, use a screen saver.