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DLC Display Co., Limited

德爾西顯示器有限公司

MODEL No: DLC1500ABG-T

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Record of Revision

Date	Revision No.	Summary
2015 10 24	1.0	Rev 1.0 was issued

1. Scope

This data sheet is to introduce the specification of DLC1500ABG-T active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, TCON, capacitive touch panel and a backlight unit. The 15.0” Display area contains 1024(RGB) X 768 pixels.

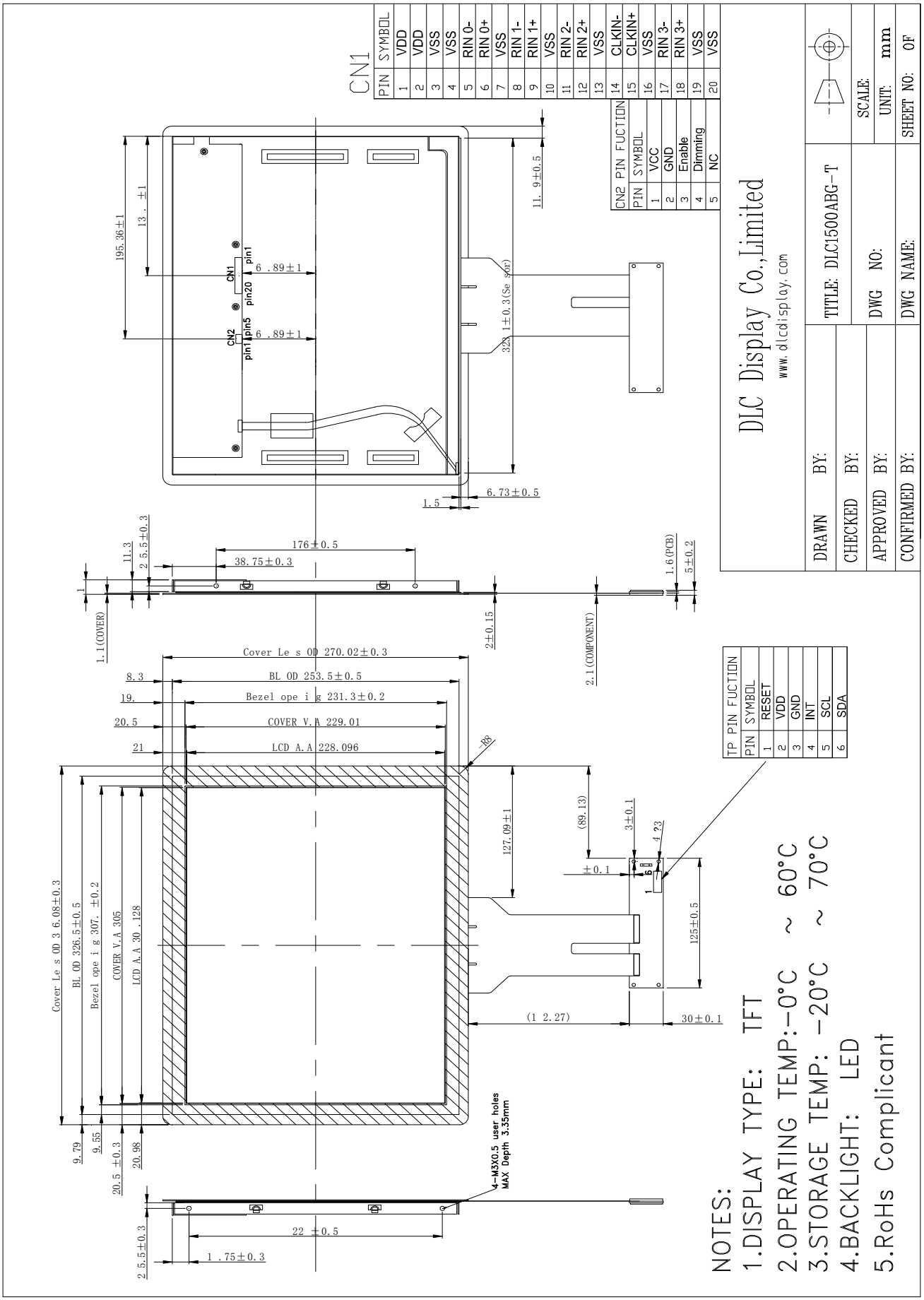
2. Application

Digital equipments which need color display, monitor, POS, video systems.

3. General Information

Item	Contents	Unit
Size	15.0	inch
Resolution	1024(RGB) X 768	/
Interface	LVDS	/
Technology type	a-Si TFT	/
Pixel pitch	0.297x0.297	mm
Pixel Configuration	R.G.B. Vertical Stripe	
Outline Dimension (W x H x D)	346.08x 270.03 x 14.00	mm
Active Area	304.128x 228.096	mm
Display Mode	Transmissive Normally White	/
Backlight Type	Edge side, 1-LED Lighting Bar Type, 28*LED	/
Weight	TBD	g

4. Outline Drawing



5. Interface signals

5.1 CN1 for LVDS

No	Symbol	Function
1	VDD	Power Supply,3.3V(Typical)
2	VDD	Power Supply,3.3V(Typical)
3	VSS	Power Ground
4	VSS	Power Ground
5	RIN 0-	-LVDS differential data input(R0-R5,G0)
6	RIN 0+	+LVDS differential data input(R0-R5,G0)
7	VSS	Power Ground
8	RIN 1-	-LVDS differential data input(G1-G5,B0-B1)
9	RIN 1+	+LVDS differential data input(G1-G5,B0-B1)
10	VSS	Power Ground
11	RIN 2-	-LVDS differential data input(B2-B5,HS,VS,DE)
12	RIN 2+	+LVDS differential data input(B2-B5,HS,VS,DE)
13	VSS	Power Ground
14	CLKIN-	-LVDS differential clock input
15	CLKIN+	+LVDS differential clock input
16	VSS	Power Ground
17	RIN 3-	-LVDS differential data input(R6-R7,G6-G7,B6-B7)
18	RIN 3+	+LVDS differential data input(R6-R7,G6-G7,B6-B7)
19	VSS	Power Ground
20	VSS	Power Ground

connector: DF14-20S-1.25H(Hirose) or equivalent

5.2 CN2 for LED Backlight

No	Symbol	Description
1	VCC	12V
2	GND	GND
3	Enable	5V-On / 0V-Off
4	Dimming	PWM Dimming
5	NC	No connection

Backlight-side connector: 3808K-F05N-03L

5.2 CN3 for CTP

No	Symbol	Description
1	RESET	Reset pin
2	VDD	Power supply(3.3V)
3	GND	Power ground.
4	INT	Interrupt output Pin
5	SCL	I2C clock signal
6	SDA	I2C data signal

6. Absolute maximum Ratings

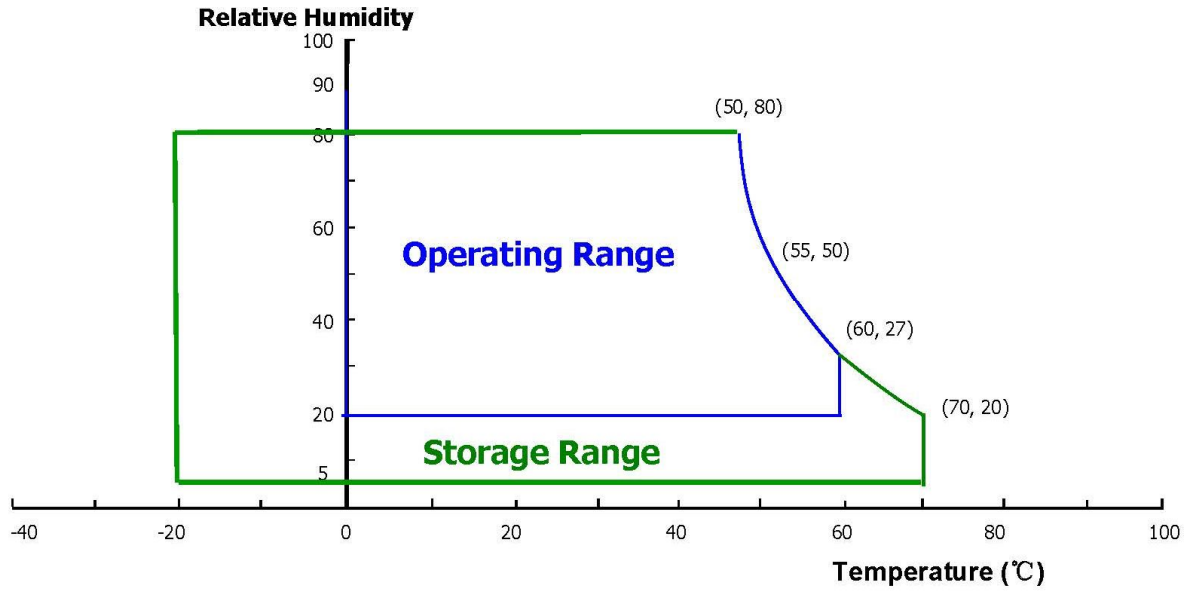
6.1. Electrical Absolute max. ratings

Item	Symbol	MIN	MAX	Unit
Power Supply Voltage for LCD	VDD	-0.3	3.6	V
Back-light LED Reverse Voltage	VR	20.3	23.8	V
Backlight Power Supply Input Voltage	HV_{DDOUT}	-0.3	28	V
Back-light LED Current	I_{HVDD}	42	-	mA

6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-0	60	℃	
Storage Temperature	TSTG	-20	70	℃	

Note 1: Temperature and relative humidity range are shown in the figure below.
Wet bulb temperature should be 39 ℃ max. and no condensation of water.



7. Electrical Specifications

7.1 Electrical characteristics for LCD

GND=0V, Ta=25℃

Parameter	Symbol	Values			Unit	Notes
		Min	Typ	Max		
Power Supply Input Voltage	V_{DD}	3.0	3.3	3.6	V	Note 1
Power Supply Current	I_{DD}	-	605	730	mA	
LED Driver Power Supply Voltage	H_{VDD}	10.8	12	12.6	V	Note 2
LED Driver Power Supply Current	I_{HVDD}	-	320	390	mA	
LED Driver Efficiency	η	-	89	-	%	
Positive-going Input Threshold Voltage	V_{IT+}	-		+100	mV	Vcom = 1.2V typ.
Negative-going Input Threshold Voltage	V_{IT-}	-100		-	mV	
Differential input common mode voltage	V_{com}		1.2		V	V_{IH}=100mV, V_{IL}=-100mV
Power Consumption	P_D	-	2.0	2.5	W	
	P_{BL}	-	3.8	4.5	W	
	P_{Total}	-	5.8	7.0	W	

Notes : 1. The supply voltage is measured and specified at the interface connector of LCM.
The current draw and power consumption specified is for 3.3V at 25 ℃
Max value at Black Pattern
2. Calculated value for reference (VLED X ILED)

7.2 Drive for Backlight

Ta=25℃

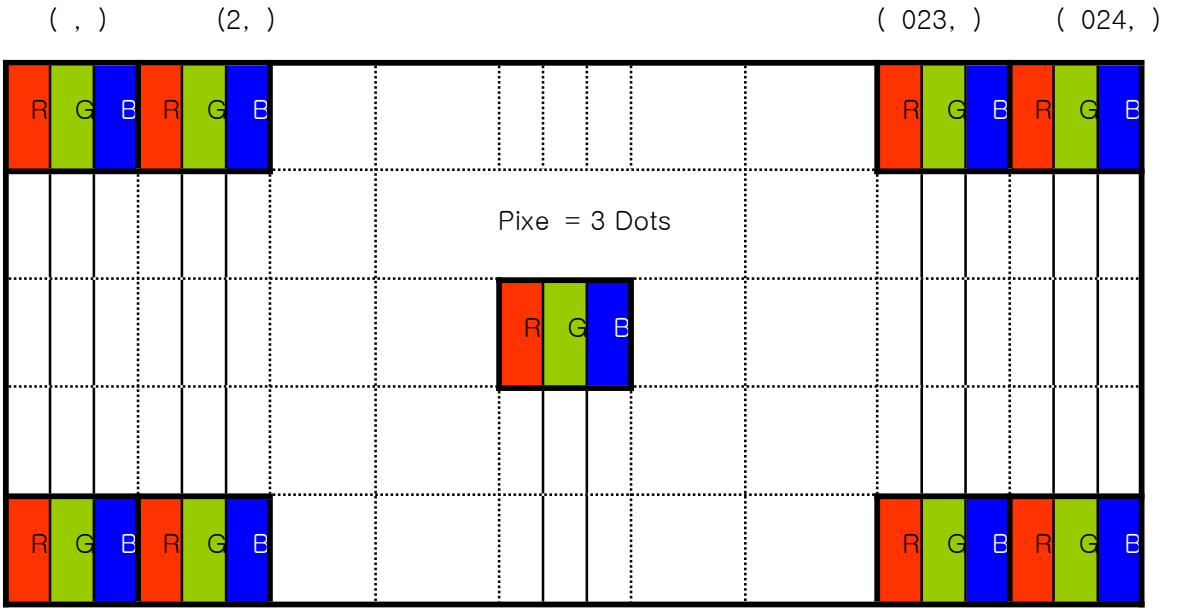
Parameter			Min.	Typ.	Max.	Unit	Remarks
LED Forward Voltage		V_F	2.9	-	3.4	V	-
LED Forward Current		I_F	-	42	-	mA	-
LED Power Consumption		P_{LED}	3.83	-	4.5	W	Note 1
LED Life-Time		N/A	30,000			Hour	IF = 60mA Note 2
Power supply voltage for Back light		V_{LED}	20.3	-	23.8	V	
Power supply Current for Back light		I_{LED}	-	168	-	mA	
EN Control Level	Backlight on	V_{ENH}	1.5	-	-	V	EN logic high voltage
	Backlight off	V_{ENL}	-	-	0.8	V	EN logic low voltage
PWM Control Level	PWM High Level	V_{PML}	1.2	-	-	V	
	PWM Low Level	V_{PML}	-	-	0.4	V	
PWM Control Frequency		F_{PWM}	0.20	-	10	KHz	
Duty Ratio		-	5		100	%	

Notes : 1. Calculator Value for reference $I_{LED} \times V_{LED} \div 0.89 = P_{LED}$

2. The LED Life-time define as the estimated time to 50% degradation of initial luminous.

8. Command/AC Timing

8.1 Data Input Format



Display Position of Input Data (V-H)

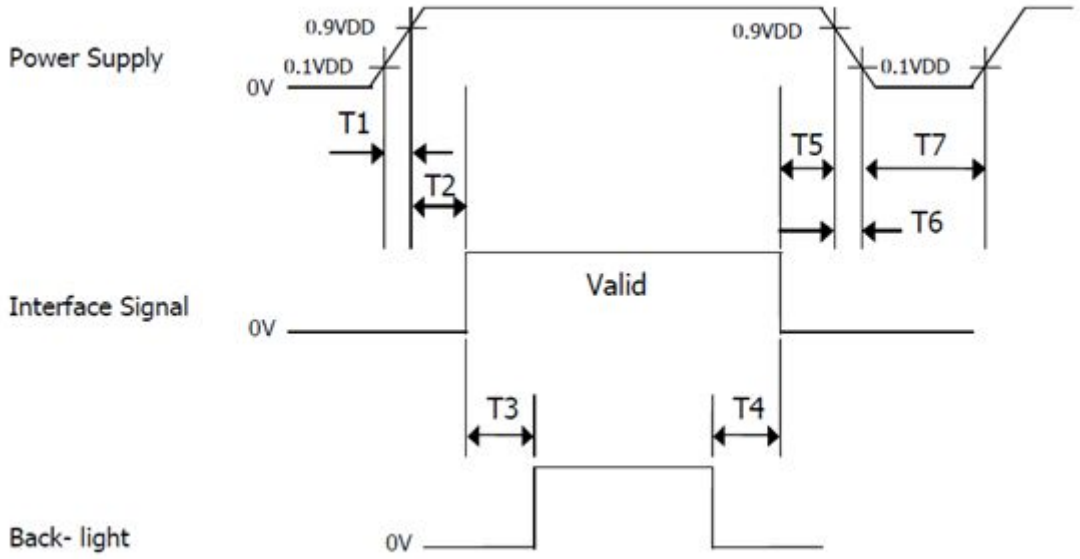
8.2 SIGNAL TIMING SPECIFICATION (operated by the DE only)

Parameter	Symbol	Value			Unit
		Min.	Typ.	Max.	
Horizontal display area	thd		1024		pixel
HSYNC period time	th	1102	1344	2046	pixel
HSYNC blanking	thb+ thfp	78	320	1022	pixel
Vertical display area	Tvd		768		H
VSYNC period time	Tv	772	806	1022	H
VSYNC blanking	Tvb+ Tvfp	4	38	254	H

8.3 INPUT SIGNALS, BASIC DISPLAY COLORS & GRAY SCALE OF COLORS

Color & Gray Scale		Input Data Signal																							
		Red Data								Green Data								Blue 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
Basic Colors	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
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	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
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	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
Gray Scale of Red	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
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	▽	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	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale of Green	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
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	▽	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	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale of Blue	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
	△	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	▽	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
Gray Scale of White	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
	△	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1
	Darker	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
	△	↑								↑								↑							
	▽	↓								↓								↓							
	Brighter	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1
	▽	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	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

8.4 POWER SEQUENCE



Parameter	Values			Units
	Min	Typ	Max	
T1	0	-	10	ms
T2	0	-	50	ms
T3	200	-	-	ms
T4	500	-	-	ms
T5	0	-	50	ms
T6	0	-	10	ms
T7	500	-	-	ms

Notes:

1. When the power supply VDD is 0V, keep the level of input signals on the low or keep high impedance.
2. Do not keep the interface signal high impedance when power is on. Back Light must be turn on after power for logic and interface signal are valid.

9. Optical Specification

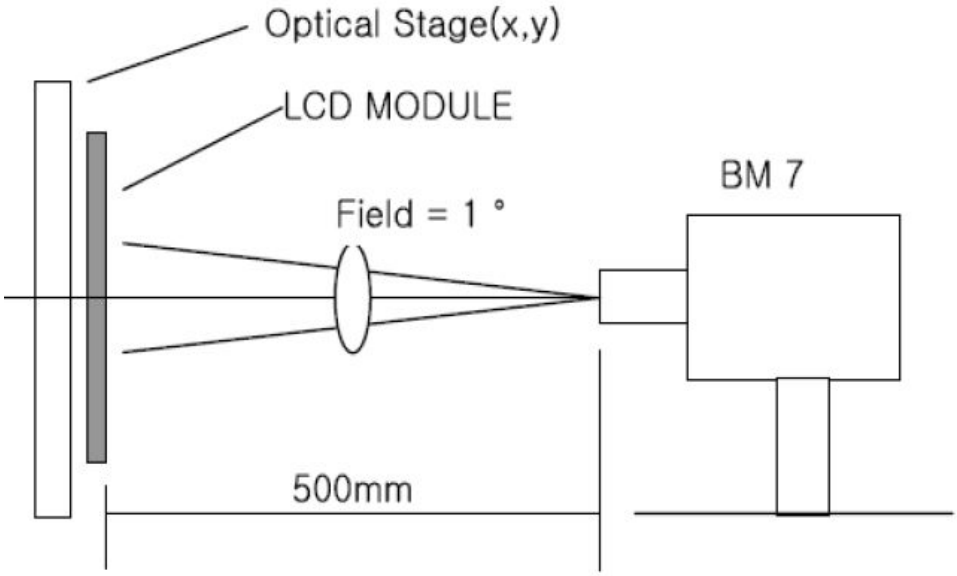
Ta=25℃

Item		Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio		CR	θ=0°	400	700	--		Note1 Note2
Response Time		Ton	25℃	--	8	12	ms	Note1 Note3
View Angles		ΘT	CR≧10	60	70	--	Degree	Note 4
		ΘB		50	60	--		
		ΘL		70	80	--		
		ΘR		70	80	--		
		ΘT	CR≧10	70	80	--		
		ΘB		70	80	--		
		ΘL		70	80	--		
		ΘR		70	80	--		
Chromaticity	White	x	Brightness is on	Typ-0.03	0.313	Typ+0.03		Note5, Note1
		y			0.329			
	Red	x			0.631			
		y			0.360			
	Green	x			0.335			
		y			0.601			
	Blue	x			0.144			
		y			0.127			
Center Luminance of White		L		210	250	--	cd/m^2	Note1 Note6
Uniformity		U		75	80	--	%	Note1 Note7
Cross talk		CT	θ=0°			2.0	%	Note8

Note 1: Definition of optical measurement system.

Temperature = 25℃(±3℃);

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

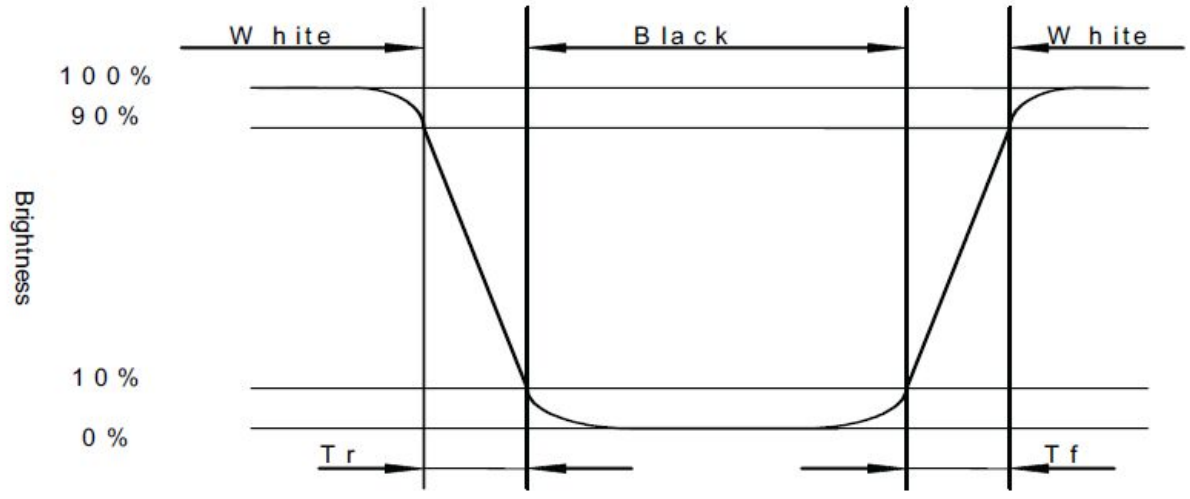


Note 2: Contrast ratio is defined as follow:

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

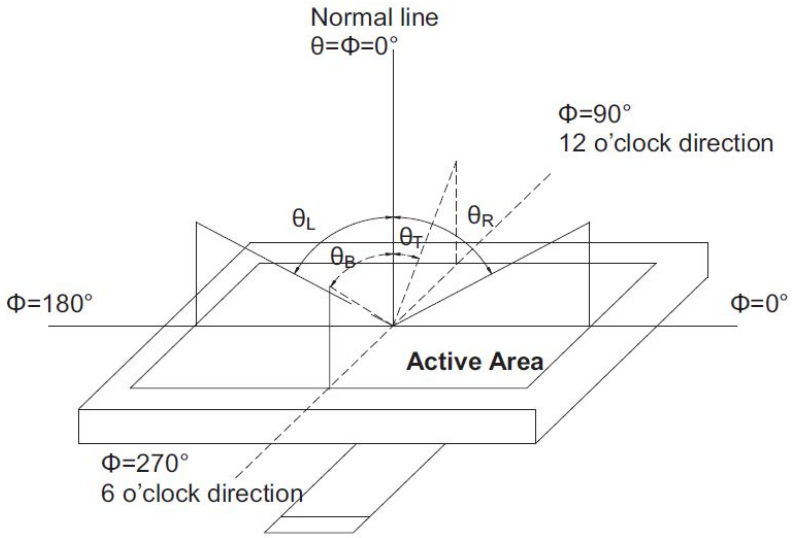
Note 3: Response time is defined as follow:

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).



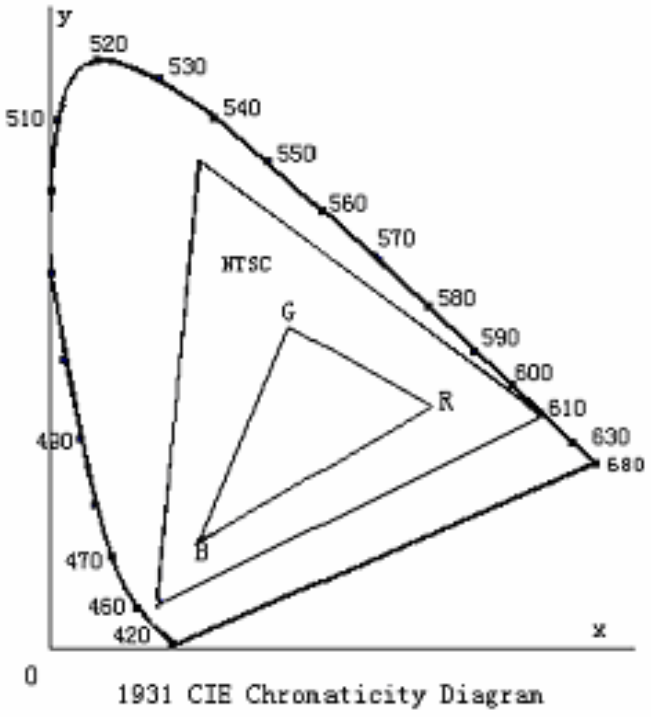
Note 4: Viewing angle range is defined as follow:

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

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

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.

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

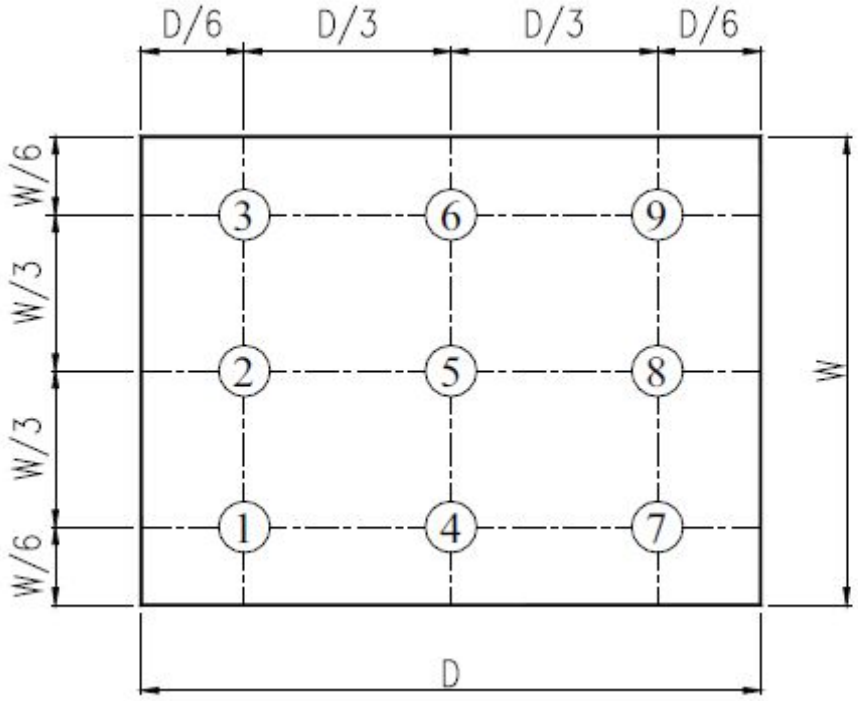
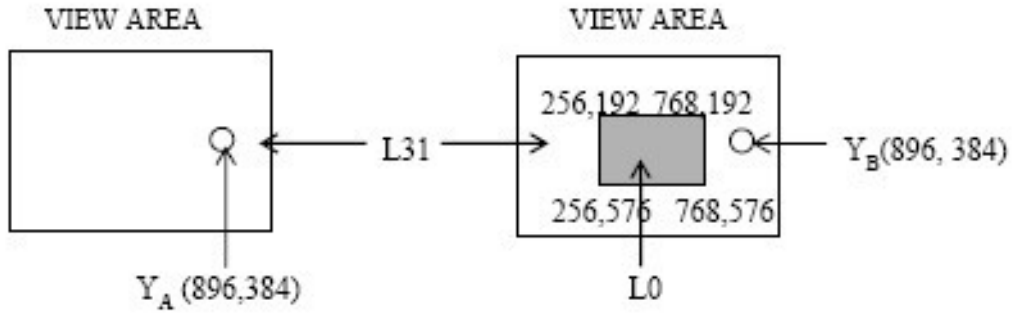


Fig. 2 Definition of uniformity

Note 8: Cross-Talk of one area of the LCD surface by another shall be measured by comparing the luminance (YA) of a 25mm diameter area, with all display pixels set to a gray level, to the luminance (YB) of that same area when any adjacent area is driven dark.



$$\text{Cross-Talk (\%)} = \left| \frac{Y_B - Y_A}{Y_A} \right| \times 100$$

Where:

Y_A = Initial luminance of measured area (cd/m^2)

Y_B = Subsequent luminance of measured area (cd/m^2)

The location measured will be exactly the same in both patterns

10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+60℃, 240 hrs	Per table in below
2	Low Temp Operation	Ta=-0℃, 240 hrs	Per table in below
3	High Temp Storage	Ta=+70℃, 240 hrs	Per table in below
4	Low Temp Storage	Ta=-20℃, 240 hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+50℃, 80% RH 240 hrs	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	0 ℃ ↔50 ℃ (0.5 hr), 100 cycle	Per table in below
7	Vibration (Non-operation)	Vibration level: 1.5G Frequency : 10 /500/10 Hz,Sine X/Y/Z Direction Period: ±X, ±Y, ±Z, 30 min	Per table in below
8	Shock (Non-operation)	Shock level: 50G Pulse width: 11msec, sine wave Direction: ±X, ±Y, ±Z	Per table in below
9	ON/OFF test	On/10 sec, Off/10 sec, 30,000 cycles	Per table in below
10	ESD	Air: ± 15KV, 150pF(330) 1sec, 8 points, 25 times/ point Contact: ± 8KV, 150pF(330) 1sec, 8 points, 25 times/ point	Per table in below
11	Package Drop Test	Height:60 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

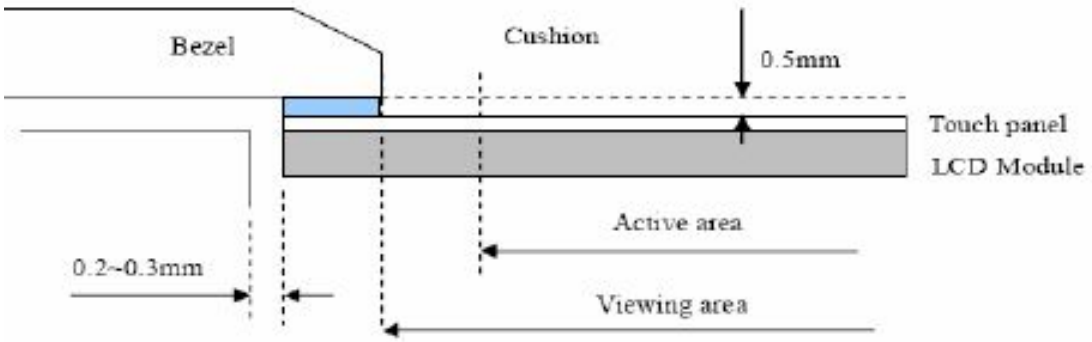
A. Ground soldering iron tips, tools and testers when they are in operation.
B. Ground your body when handling the products.
C. Power on the LCD module before applying the voltage to the input terminals.
D. Do not apply voltage which exceeds the absolute maximum rating.
E. Store the products in an anti-electrostatic 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

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.