DLC Display Co., Limited

德爾西顯示器有限公司

MODEL No: DLC0130BZS-T-1

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Record of Revision

Date	Revision No.	Summary
2017-05-07	1.0	Rev 1.0 was issued

1. Scope

   This data sheet is to introduce the specification of DLC0130BZS-T-1 active matrix TFT module. It is composed of a color TFT-LCD panel, driver IC, FPC ,CTP and a backlight unit. The 1.3'' display area contains 240(RGB) x 240 pixels.
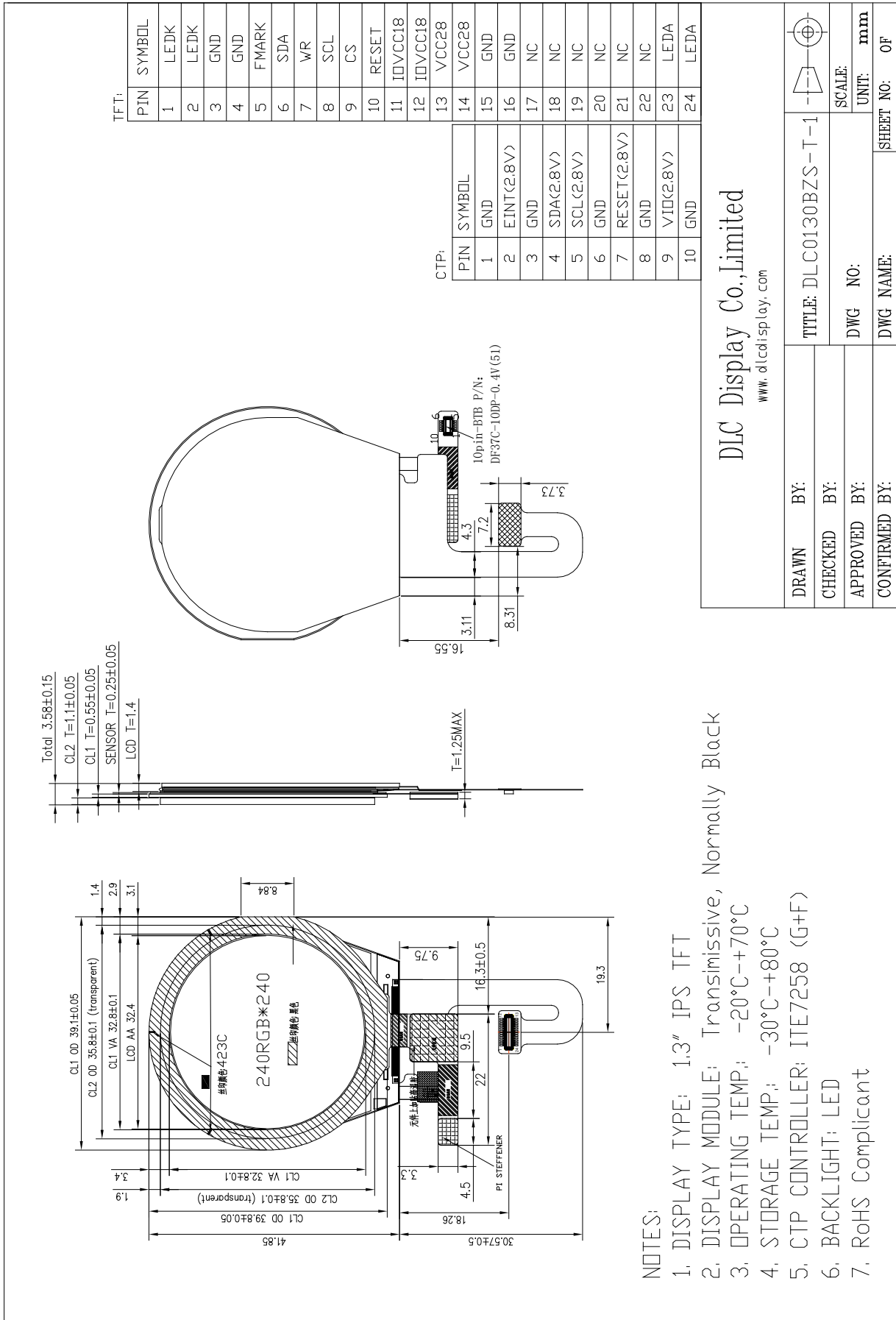
2. Application

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

3. General Information

Item	Contents	Unit
Size	1.3	inch
Resolution	240 (RGB) x 240	/
Interface	2 lane SPI 3-wire interface	/
Technology type	IPS	/
Pixel pitch	0.045 x0.135	mm
Pixel Configuration	R.G.B. Vertical Stripe	
Outline Dimension (W x H x D)	39.10 x 41.85 x 3.58	mm
Active Area	32.40x 32.40	mm
Display Mode	Transmissive Normally Black	/
Driver IC	ST7789V	/
Backlight Type	LED	/
Weight	TBD	g

4. Outline Drawing

TFT:

PIN	SYMBOL
1	LEDK
2	LEDK
3	GND
4	GND
5	FMARK
6	SDA
7	WR
8	SCL
9	CS
10	RESET
11	IOVCC18
12	IOVCC18
13	VCC28
14	VCC28
15	GND
16	GND
17	NC
18	NC
19	NC
20	NC
21	NC
22	NC
23	LEDA
24	LEDA

CTP:

PIN	SYMBOL
1	GND
2	EINT(2.8V)
3	GND
4	SDA(2.8V)
5	SCL(2.8V)
6	GND
7	RESET(2.8V)
8	GND
9	VID(2.8V)
10	GND

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DRAWN	BY:		TITLE: DLC0130BZS-T-1
CHECKED	BY:		DWG NO:
APPROVED	BY:		
CONFIRMED	BY:		DWG NAME:

TITLE: DLC0130BZS-T-1

SCALE:
UNIT: mm
SHEET NO: OF

10pin-BTB P/N:
DF37C-10DP-0.4V(51)

240RGB*240

NOTES:
1. DISPLAY TYPE: 1.3" IPS TFT
2. DISPLAY MODULE: Transmissive, Normally Black
3. OPERATING TEMP.: -20°C～+70°C
4. STORAGE TEMP.: -30°C～+80°C
5. CTP CONTROLLER: ITE7258 (G+F)
6. BACKLIGHT: LED
7. RoHS Compliant

5. Interface signals

PIN	Symbol	Description	Remark
1	LEDK	Power supply for Backlight (Cathode terminal)	
2	LEDK	Power supply for Backlight (Cathode terminal)	
3	GND	Power Ground	
4	GND	Power Ground	
5	FMARK	Tearing effect output	
6	SDA	Serial communication data lane 1	
7	WR	Serial communication data lane 2	
8	SCL	Serial communication clock	
9	CS	Chip select signal	
10	RESET	Reset control signal	
11	IOVCC18	Power supply for I/O interface	
12	IOVCC18	Power supply for I/O interface	
13	VCC28	Power supply for system circuit	
14	VCC28	Power supply for system circuit	
15	GND	Power Ground	
16	GND	Power Ground	
17	NC	No Connect	
18	NC	No Connect	
19	NC	No Connect	
20	NC	No Connect	
21	NC	No Connect	
22	NC	No Connect	
23	LEDA	Power supply for Backlight (anode terminal)	
24	LEDA	Power supply for Backlight (anode terminal)	

CTP Pin Difinition

PIN	Symbol	Description	Remark
1	GND	Power Ground	
2	EINT2.8V	Interrupt output pin	
3	GND	Power Ground	
4	SDA2.8V	Data input	
5	SCL2.8V	Clock for the data input	
6	GND	Power Ground	
7	RESET2.8V	RESET pin for TP	
8	GND	Power Ground	
9	VIO2.8V	Power supply	
10	GND	Power Ground	

6. Absolute maximum Ratings

6.1 Electrical Absolute max. ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Supply voltage	VCC	-0.3	4.6	V	
Power voltage for logic	IOVCC	-0.3	4.6	V	
Storage Humidity	HD	-	90	%RH	

6.2 Environment Conditions

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

7. Electrical Specifications

7.1 Electrical characteristics

Parameter	Symbol	Values			Unit	Remark
		MIN	TYP	MAX		
Supply voltage	VCC	2.4	2.8	3.3	V	-
Power voltage for logic	IOVCC	1.65	1.8	3.3	V	-
Input High Voltage	VIH	0.7IOVCC	-	IOVCC	V	-
Input Low Voltage	VIL	GND	-	0.3IOVCC	V	-
Output High Voltage	VOH	0.8IOVCC	-	IOVCC	V	IOH=-1.0mA
Output Low Voltage	VOL	GND	-	0.2IOVCC	V	IOH=1.0mA
I/0 Leak Current	ILI	-	-	1	uA	

7.2 LED Backlight   Ta=25℃

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	IF	-	20	-	mA	If=20mA
Forward Voltage	VF	5.8	6.4	6.8	V	
Backlight Color		white				If=20mA

LEDA O ——▷|——▷|—— OLEDK
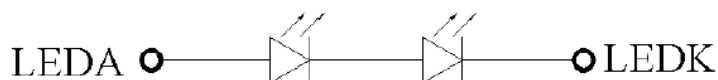
BACKLIGHT LED CIRCUIT
2PCS LED

8. Command/AC Timing

8.1 Power ON/OFF Sequence

VIO28 and VIO18 can be applied in any order.

VIO28 and VIO18 can be power down in any order.

During power off, if LCD is in the Sleep Out mode, VIO28 and VIO18 must be powered down minimum 120msec after RESX has been released.

During power off, if LCD is in the Sleep In mode, VIO28 or VIO18 can be powered down minimum 0msec after RESX has been released.

CS can be applied at any timing or can be permanently grounded. RESET has priority over CS.

Note 1: There will be no damage to the display module if the power sequences are not met.

Note 2: There will be no abnormal visible effects on the display panel during the Power On/Off Sequences.

Note 3: There will be no abnormal visible effects on the display between end of Power On Sequence and before receiving Sleep Out command. Also between receiving Sleep In command and Power Off Sequence.

Note 4: If RESX line is not held stable by host during Power On Sequence as defined in the sequence below, then it will be necessary to apply a Hardware Reset (RESET) after Host Power On Sequence is complete to ensure correct operation. Otherwise function is not guaranteed.

The power on/off sequence is illustrated below
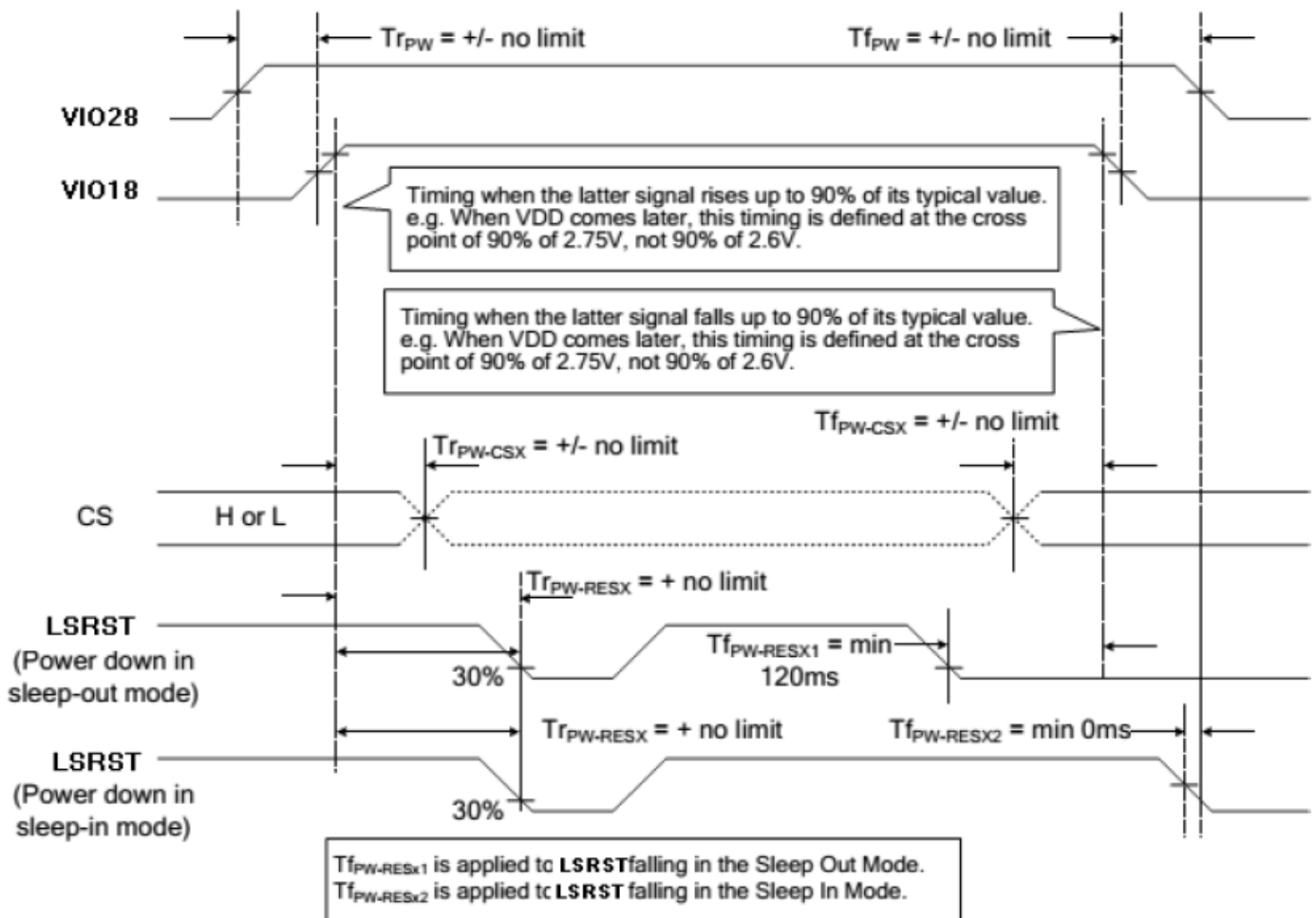
Uncontrolled Power Off

The uncontrolled power-off means a situation which removed a battery without the controlled power off sequence. It will neither damage the module or the host interface.

If uncontrolled power-off happened, the display will go blank and there will not any visible effect on the display (blank display) and remains blank until "Power On Sequence" powers it up.

8.2 Send data Sequence

The write mode of the interface means the micro controller writes commands and data to the LCD driver.3-lines serial data packet contains a control bit D/CX and a transmission byte. Any instruction can be sent in any order to the driver. The MSB is transmitted first. The serial interface is initialized when CS is high. In this state, SCL clock pulse or SDA data have no effect. A falling edge on CS enables the serial interface and indicates the start of data transmission.

When CS is "high", SCL clock is ignored. During the high period of CS the serial interface is initialized. At the falling edge of CS, SCL can be high or low. SDA is sampled at the rising edge of SCL. D/CX indicates whether the byte is command (D/CX='0') or parameter/RAM data (D/CX='1'). D/CX is sampled when first rising edge of SCL (3-line serial interface) . If CS stays low after the last bit of command/data byte, the serial interface expects the D/CX bit (3-line serial interface) .

CSX can be "H"between parameter/command and parameter/command SCL, and SDA during CSX="H" is ignored.
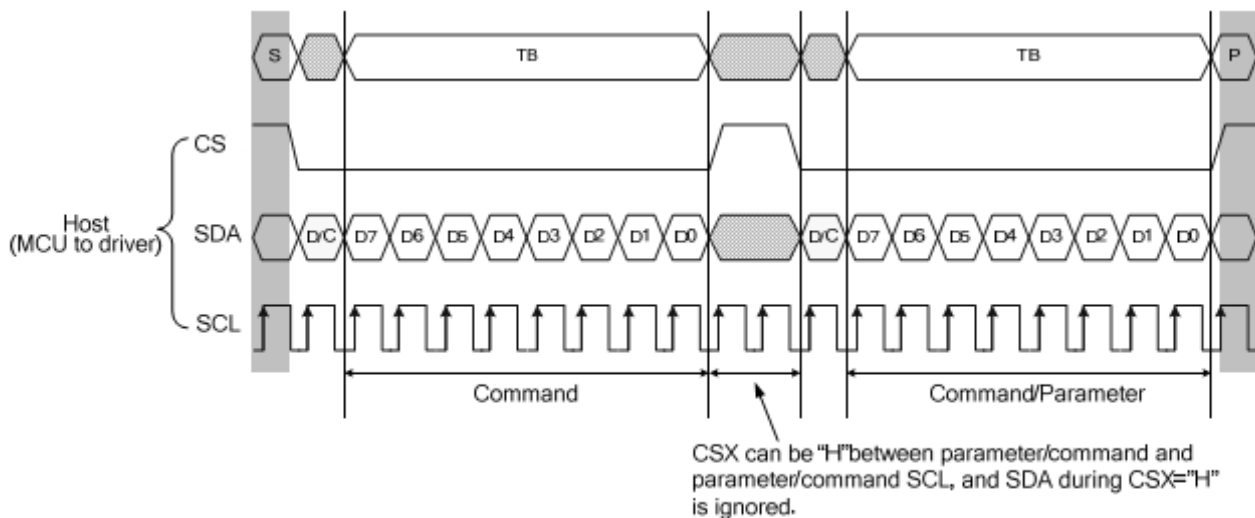
3-line serial interface write protocol (write to register with control bit in transmission)

The read mode of the interface means that the micro controller reads register value from the driver. To achieve read function, the micro controller first has to send a command (read ID or register command) and then the following byte is transmitted in the opposite direction. After that CS is required to go to high before a new command is send . The driver samples the SDA (input data) at rising edge of SCL, but shifts SDA (output data) at the falling edge of SCL. Thus the micro controller is supported to read at the rising edge of SCL.

3-line serial protocol (for RDID1/RDID2/RDID3/0Ah/0Bh/0Ch/0Dh/0Eh/0Fh command: 8-bit read):
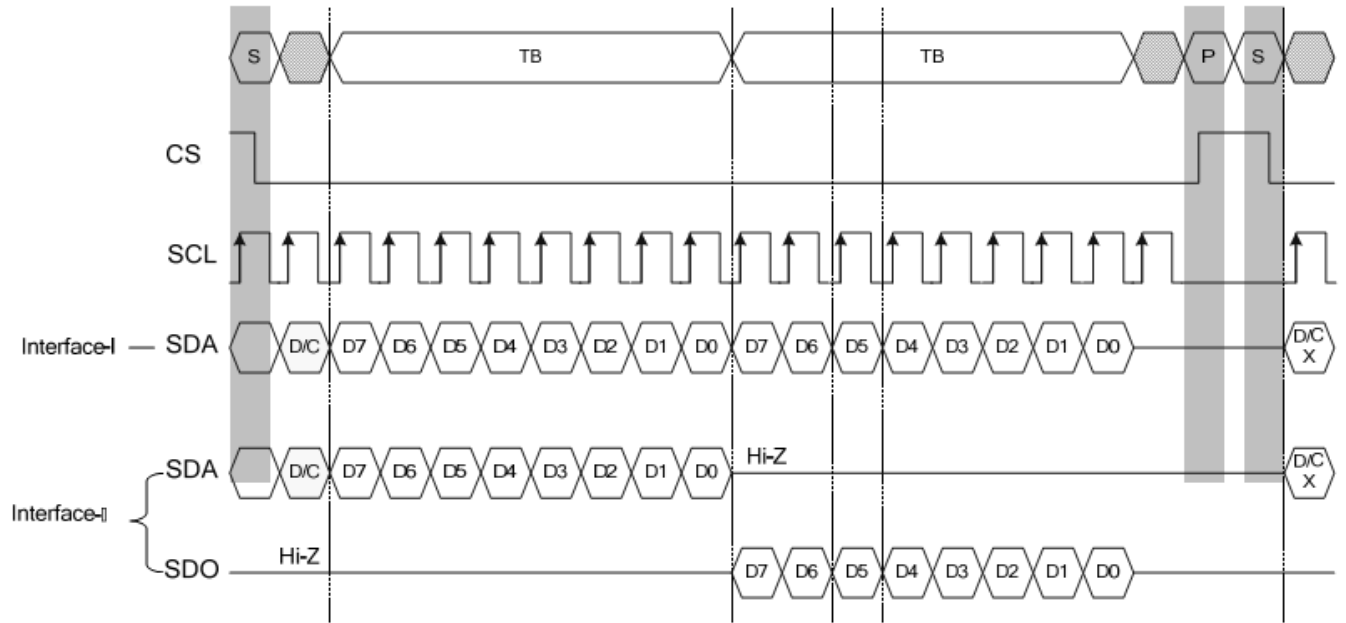
9   Optical Specification

Ta=25℃

Item		Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio		CR	θ=0°	-	700	-		Note1 Note2
Response Time		Ton+ Toff	25℃	-	35	50	ms	Note1 Note3
View Angles		ΘT	CR≧10	60	80	-	Degree	Note 4
		ΘB		60	80	-		
		ΘL		60	80	-		
		ΘR		60	80	-		
Chromaticity	Red	x	Brightness is on	0.575	0.625	0.675		Note5, Note1
		y		0.293	0.343	0.393		
	Green	x		0.288	0.338	0.388		
		y		0.549	0.599	0.649		
	Blue	x		0.106	0.156	0.206		
		y		0.040	0.090	0.140		
	White	x		-	0.300	-		
		y		-	0.330	-		
NTSC		S		-	60	-	%	Note5
Luminance		L		-	310	-	cd/m^2	Note1 Note6
Uniformity		U		80	-	-	%	Note1 Note7

Note 1: Definition of optical measurement system.

Temperature = 25℃(±3℃);   LED back-light: ON, Environment brightness < 150 lx

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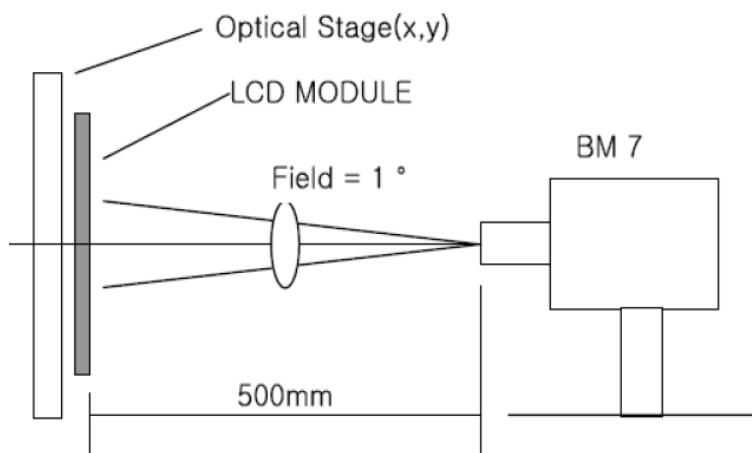
Note 2: Contrast ratio is defined as follow:

$$\text{Contrast Ratio} = \frac{\text{Surface Luminance with all white pixels}}{\text{Surface Luminance with all black pixels}}$$
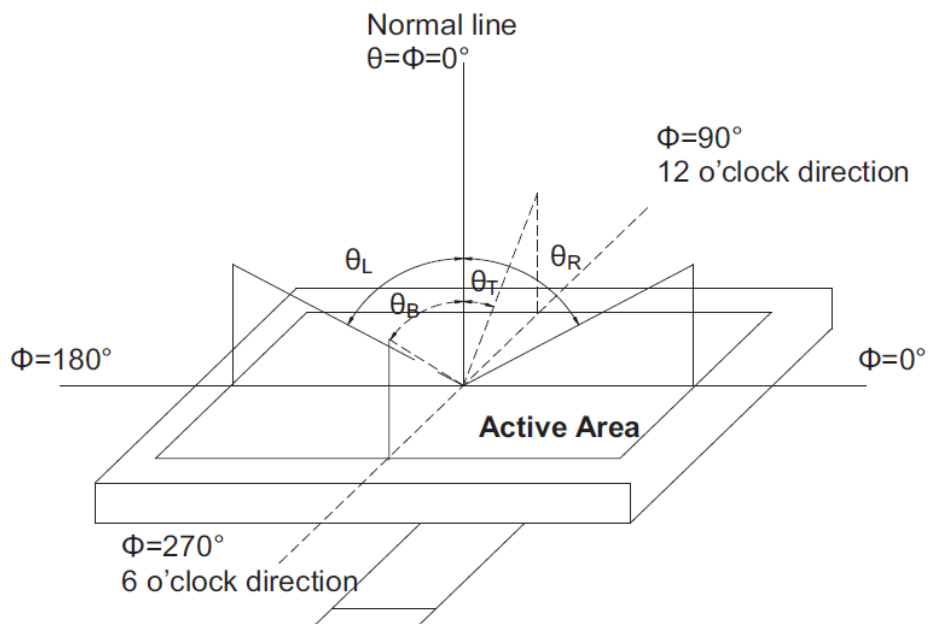
Note 3: Response time is defined as follow:

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).
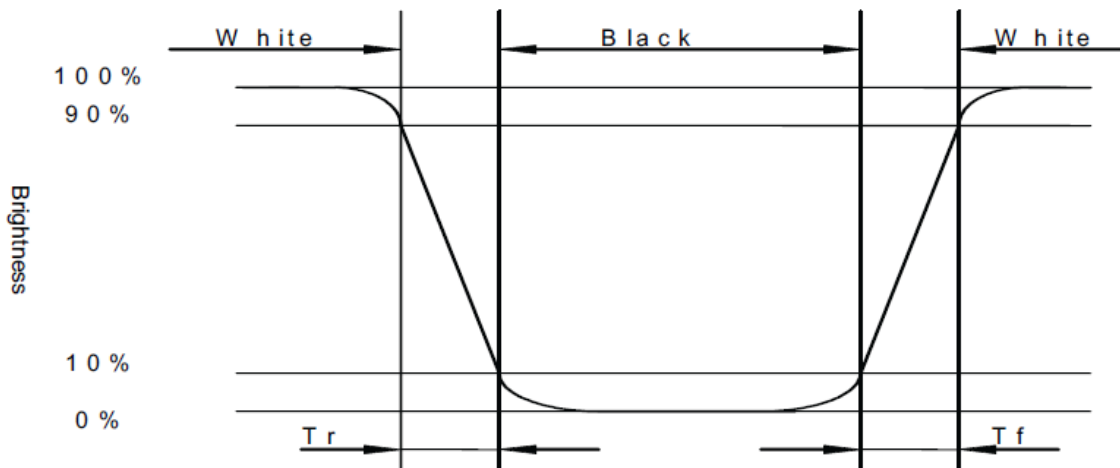
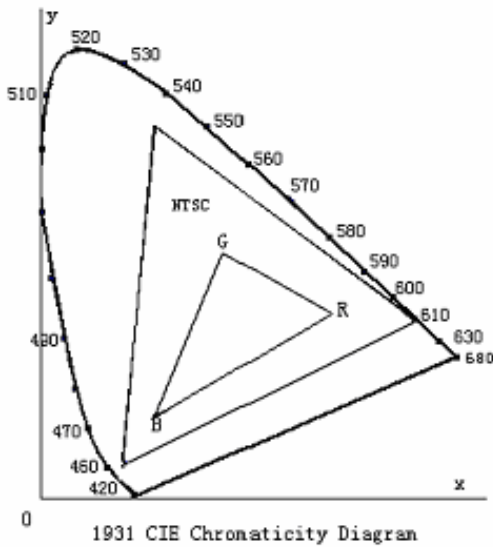

Note 4: Viewing angle range is defined as follow:

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

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

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.

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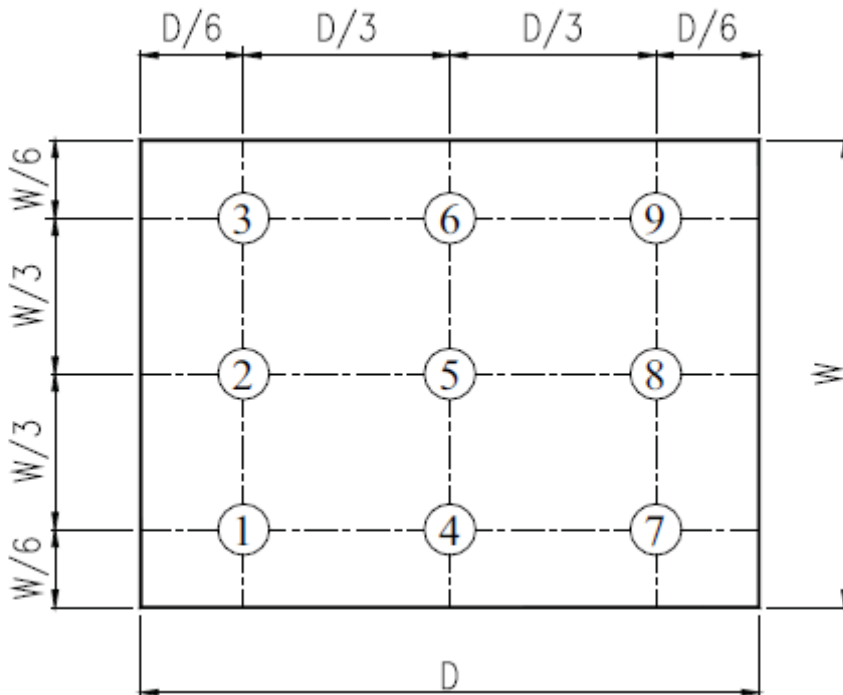

Fig. 2 Definition of uniformity

10 Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+70℃, 120hrs	Per table in below
2	Low Temp Operation	Ta=-20℃, 120hrs	Per table in below
3	High Temp Storage	Ta=+80℃, 120hrs	Per table in below
4	Low Temp Storage	Ta=-30℃, 120hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+60℃, 90% RH 120 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30℃ 30 min~+80℃ 30 min, Change time:5min, 10 Cycles	Per table in below
7	ESD (Operation)	Air Discharge: Apply 6 KV with 5 times discharge for each polarity +/-; Contact Discharge: Apply 250V with 5 times discharge for each polarity +/-	Per table in below
8	Vibration (Non-operation)	10~55Hz (1 minute) 1.5mm X,Y and Z direction * (each 2hrs)	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

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℃±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.