

**DLC Display Co., Limited**

德爾西顯示器有限公司



MODEL No: DLC0200EUG

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### Record of Revision

Date	Revision No.	Summary
2010-12-09	1.0	Rev 1.0 was issued

### 1. Scope

This data sheet is to introduce the specification of DLC0200EUG active matrix TFT module. It is composed of a color TFT-LCD panel, driver ICs, FPC and a backlight unit. The 2.0" display area contains 240(RGB) x320 pixels.

### 2. Application

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

### 3. General Information

Item	Contents	Unit
Size	2.0	inch
Resolution	240(RGB) x 320	/
Interface	CPU/SPI+RGB	/
Technology type	a-Si TFT	/
Pixel pitch	0.1275x0.1275	mm
Pixel Configuration	RGB stripes	
Outline Dimension (W x H x D)	36.72x52.74x2.40	mm
Active Area	30.60 x 40.80	mm
Display Mode	Transflective Normally white	/
Backlight Type	LED	/
Driver IC	HX8347	/

### 4. Outline Drawing

No.	Pin name	No.	Pin name
1	GND	22	DB13
2	CABC	23	DB12
3	VCC	24	DB11
4	VSYNC	25	DB10
5	HISYNC	26	DB09
6	DOTCLK	27	DB08
7	DE	28	DB07
8	RESET	29	DB06
9	CS	30	DB05
10	DC	31	DB04
11	RD	32	DB03
12	WR_SCL	33	DB02
13	IM3	34	DB01
14	IM2	35	DB00
15	IMI	36	IOWCC
16	IM0	37	LEDK4
17	SDA	38	LEDK3
18	DB17	39	LEDK2
19	DB16	40	LEDK1
20	DB15	41	LEDA
21	DB14		

**LED CIRCUIT**

If=60mA, Vf=2.9-3.4V

COMPONENT AREA (H=1.0MAX)

无件区

弯折出货

DETAIL PIXEL (SCALE 100:1)

2540.2  
2324.05  
2140.05  
1940.00  
1430.00  
0.143000

2.40±0.15

10.00±0.3

W=0.30

12.60

35.82

16.60±0.3

0.50(MAX)

(14.25)

(6.99)

2-0.60

2-1.00

1.00(MAX)

0.20 ± 0.03

stiffener

contact side

0.1275

0.0125

0.1275

BGR

36.72±0.2(OUTLINE)

34.20±0.2(TFT)

32.60±0.2(MDS V.A)

30.60(A.A)

12.00

12.36

R/G/B

240(H)X80(V) DOTS

2.0" TFT

40.80(A.A)

42.80±0.2(MDS V.A)

49.32±0.2(TFT)

52.74±0.2(OUTLINE)

NOTES:

- 1.DISPLAY TYPE: TFT
- 2.DISPLAY MODULE: TRANSFLECTIVE
- 3.OPERATING TEMP: -30° C---+70° C
- 4.STORAGE TEMP: -40° C---+85° C
- 5.Backlight: LED
6. RoHS Compliant

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DRAWN BY: TITLE: DLC0200EUG

CHECKED BY: SCALE:

APPROVED BY: DWG NO:

CONFIRMED BY: Dwg NAME: SHEET NO: OF

UNIT: mm

## 5. Interface signals

Interface NO.	Symbol	I/O	Description	Remark
1	GND	P	Power ground pin. Make sure GND=0V.	-
2	CABC	O	CABC backlight control PWM signal output	
3	VCC	P	Power Supply, VCI =2.3 to 3.3V (Driver power supply voltage range)	
4	VSYNC	I	Vertical synchronizing signal in RGB interface.	
5	HSYNC	I	Horizontal synchronizing signal in RGB interface	
6	DOTCLK	I	Dot clock signal in RGB interface.	
7	DE	I	Data ENABLE signal in RGB I/F mode	
8	RESET	I	Reset pin. Setting either pin low initializes the LSI. Must be reset after power is supplied.	
9	CS	I	Chip select signal. Low: chip can be accessed; High: chip cannot be accessed.	
10	DC	I	Command / parameter or display data selection pin.	
11	RD	I	Read enable pin in 80 parallel bus system interface	
12	WR_SCL	I	(WR)Write enable pin I80 parallel bus system interface.(SCL) server as serial data clock in serial bus system interface	
13	IM3	I	System interface select.	Note 1
14	IM2			
15	IM1			
16	IM0			
17	SDA	I/O	Serial data input pin and output pin in serial bus system interface. The data is inputted on the rising edge of the SCL signal.	
18	DB17	I/O	18-bit bi-directional data bus.	
19	DB16	I/O		
20	DB15	I/O		
21	DB14	I/O		
22	DB13	I/O		
23	DB12	I/O		
24	DB11	I/O		



25	DB10	I/O		
26	DB09	I/O		
27	DB08	I/O		
28	DB07	I/O		
29	DB06	I/O		
30	DB05	I/O		
31	DB04	I/O		
32	DB03	I/O		
33	DB02	I/O		
34	DB01	I/O		
35	DB00	I/O		
36	IOVCC	P	IOVCC = 1.65 to 3.3V (Logic IO power supply voltage range)	-
37	LEDK4	P	LEDK4( CATHODE )	
38	LEDK3	P	LEDK3( CATHODE )	
39	LEDK2	P	LEDK2( CATHODE )	
40	LEDK1	P	LEDK1( CATHODE )	
41	LEDA	P	LED ANODE.	

Note1: Select the MPU system interface mode

IM3	IM2	IM1	IM0	Interface	DNC_SCL	NWR_SCL	Data Bus use	
							Register/Content	GRAM
0	0	0	0	8080 MCU 16-bit parallel type I	DNC	NWR	D7-D0	D15-D0: 16-bit data
0	0	0	1	8080 MCU 8-bit parallel type I	DNC	NWR	D7-D0	D7-D0: 8-bit data
0	0	1	0	8080 MCU 16-bit parallel type II	DNC	NWR	D8-D1	D17-10, D8-D1: 16-bit data
0	0	1	1	8080 MCU 8-bit parallel type II	DNC	NWR	D17-D10	D17-D10: 8-bit data
0	1	0	ID	3-wire serial interface	-	SCL		SDA
0	1	1	-	4-wire serial interface	DNC	SCL		SDA
1	0	0	0	8080 MCU 18-bit parallel type I	DNC	NWR	D7-D0	D17-D0: 18-bit data
1	0	0	1	8080 MCU 9-bit parallel type I	DNC	NWR	D7-D0	D8-D0: 9-bit data
1	0	1	0	8080 MCU 18-bit parallel type II	DNC	NWR	D8-D1	D17-D0: 18-bit data
1	0	1	1	8080 MCU 9-bit parallel type II	DNC	NWR	D17-D10	D17-D9: 9-bit data
Other Setting				Setting Invalid				

## 6. Absolute maximum Ratings

### 6.1. Electrical Absolute max. ratings

Parameter	Symbol	MIN	MAX	Unit	Remark
Logic Supply Voltage	VCC/IOVCC	-0.3	4.6	V	
Input Voltage	VIN	-0.3	IOVCC +0.5	V	

### 6.2. Environment Conditions

Item	Symbol	MIN	MAX	Unit	Remark
Operating Temperature	TOPR	-30	70	°C	
Storage Temperature	TSTG	-40	85	°C	

## 7. Electrical Specifications

### 7.1 Electrical characteristics

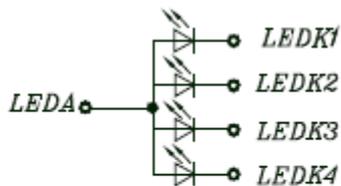
GND=0V, Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Logic Supply Voltage	VCC	2.3	2.8	3.3	V	
I/O power supply	IOVCC	1.65	1.8/2.8	3.3	V	
Input Current	I <sub>dd</sub>	-	4.98	9.96	mA	
Input Signal Voltage	V <sub>IL</sub>	GND	--	0.3xIOVCC	V	
	V <sub>IH</sub>	0.7xIOVCC	--	IOVCC	V	
Output Signal Voltage	V <sub>OL</sub>	GND	--	0.2xIOVCC	V	
	V <sub>OH</sub>	0.8xIOVCC	--	IOVCC	V	

### 7.2 LED Backlight

Ta=25°C

Item	Symbol	MIN	TYP	MAX	Unit	Remark
Forward Current	I <sub>F</sub>		15		mA	For One LED
Forward Voltage	V <sub>F</sub>	2.9	3.2	3.4		



LED CIRCUIT

## 8. Command/AC Timing

### 8.1 AC Characteristics

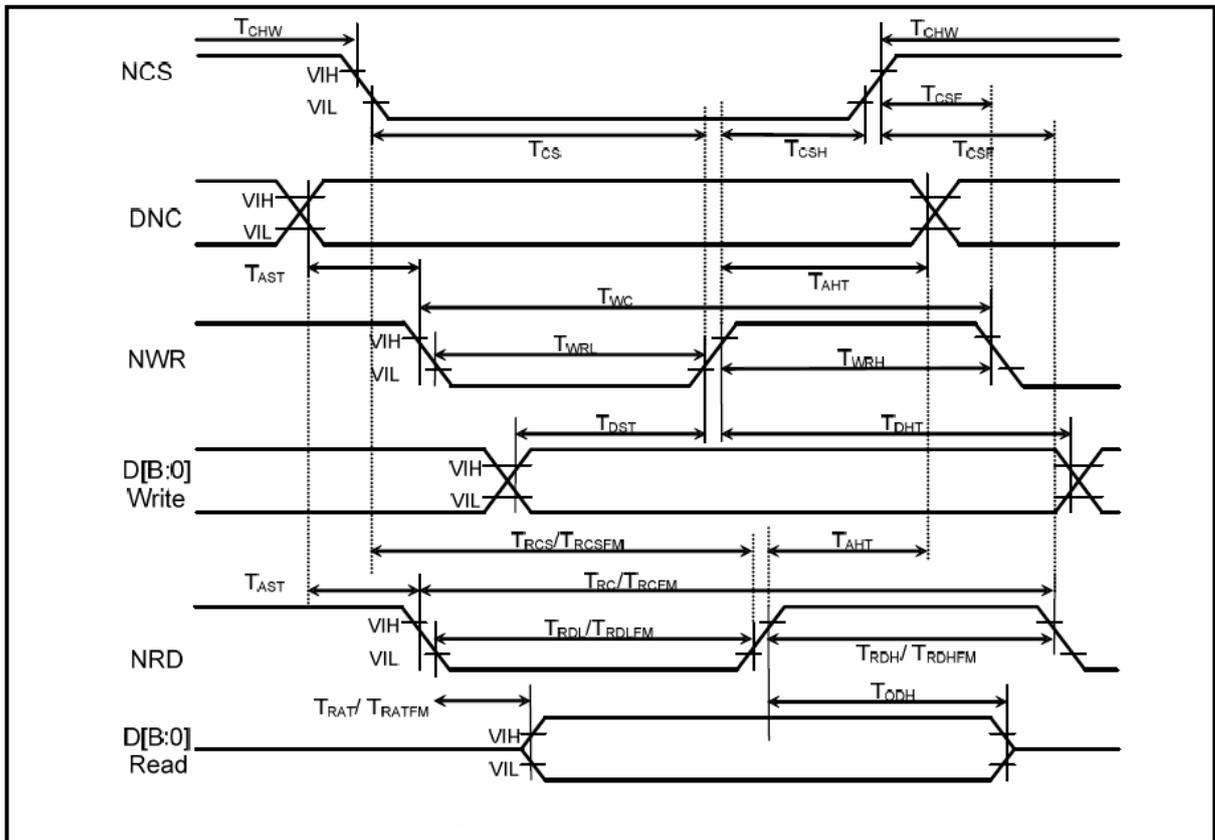


Figure 11.1 Parallel interface characteristics (8080-series MPU)

(VSSA=0V, IOVCC=1.65V to 3.3V, VCI=2.3V to 3.3V, T<sub>A</sub> = -30 to 70° C)

Signal	Symbol	Parameter	Min.	Max.	Unit	Description
DNC_SCL	tAST	Address setup time	0	-	ns	-
	tAHT	Address hold time (Write/Read)	10	-	ns	-
NCS	tCHW	Chip select "H" pulse width	0	-		
	tCS	Chip select setup time (Write)	15	-		
	tRCS	Chip select setup time (Read ID)	45	-	ns	-
	tRCSFM	Chip select setup time (Read FM)	355	-		
	tCSF	Chip select wait time (Write/Read)	10	-		
	tCSH	Chip select hold time	10	-		
NWR_SCL	tWC	Write cycle	66	-	ns	-
	tWRH	Control pulse "H" duration	15	-		
	tWRL	Control pulse "L" duration	15	-		
NRD(ID)	tRC	Read cycle (ID)	160	-	ns	When read ID data
	tRDH	Control pulse "H" duration (ID)	90	-		
	tRDL	Control pulse "L" duration (ID)	45	-		
NRD(FM)	tRCFM	Read cycle (FM)	450	-	ns	When read from frame memory
	tRDHFM	Control pulse "H" duration (FM)	90	-		
	tRDLFM	Control pulse "L" duration (FM)	355	-		
DB17 to DB0	tDST	Data setup time	10	-		
	tDHT	Data hold time	10	-		
	tRAT	Read access time (ID)	-	40	ns	For maximum CL=30pF
	tRATFM	Read access time (FM)	-	340		For minimum CL=8pF
	tODH	Output disable time	20	80		

Note: The input signal rise time and fall time (tr, tf) is specified at 15 ns or less.

Logic high and low levels are specified as 30% and 70% of IOVCC for Input signals.

9. Optical Specification

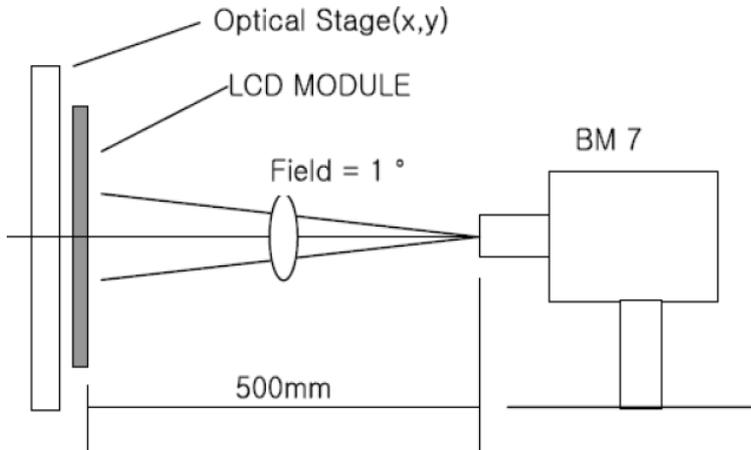
Ta=25°C

Item	Symbol	Condition	Min	Typ.	Max.	Unit	Remark
Contrast Ratio	CR	$\theta=0^\circ$	37	74	-		Note1 Note2
Response Time	Ton/ Toff	25°C	-	33	50	ms	Note1 Note3
View Angles	$\theta T$	$CR \geq 10$	70	80	-	Degree	Note 4
	$\theta B$		30	40	-		
	$\theta L$		48	58	-		
	$\theta R$		17	27	-		
Chromaticity	White	Brightness is on	x	0.2428	0.3028	0.3628	Note5, Note1
			y	0.2557	0.3157	0.3757	
	Red		x	0.4519	0.5019	0.5519	
			y	0.2510	0.3010	0.3510	
	Green		x	0.2824	0.3324	0.3824	
			y	0.4674	0.5174	0.5674	
	Blue		x	0.1204	0.1704	0.2204	
			y	0.0967	0.1467	0.1967	
NTSC	S			30		%	Note5
Luminance	L		72	90	-	cd/m <sup>2</sup>	Note1 Note6
Uniformity (White)	U		80	90	-	%	Note1 Note7
Reflectivity	R		-	1.3	-	%	Note8

Note 1: Definition of optical measurement system.

Temperature = 25°C (±3°C)

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

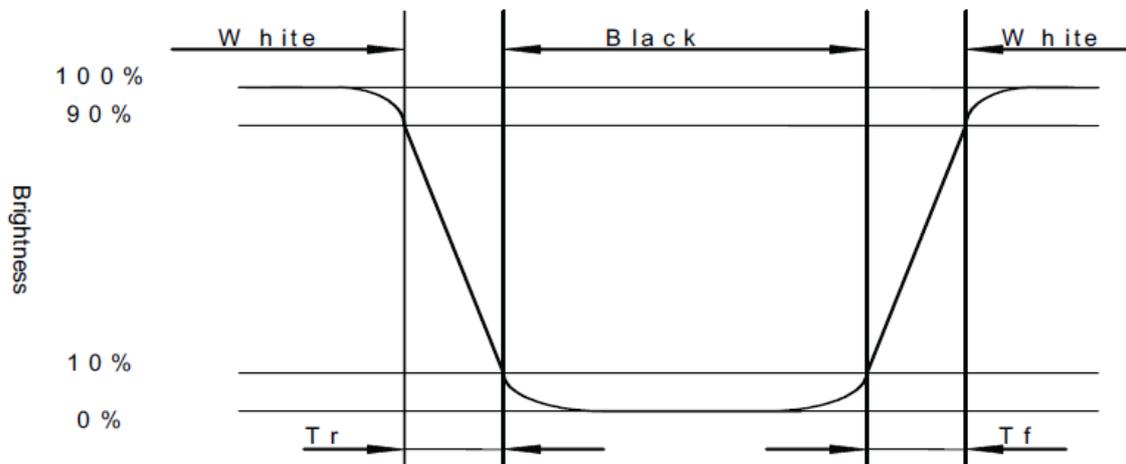


Note 2: Contrast ratio is defined as follow:

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

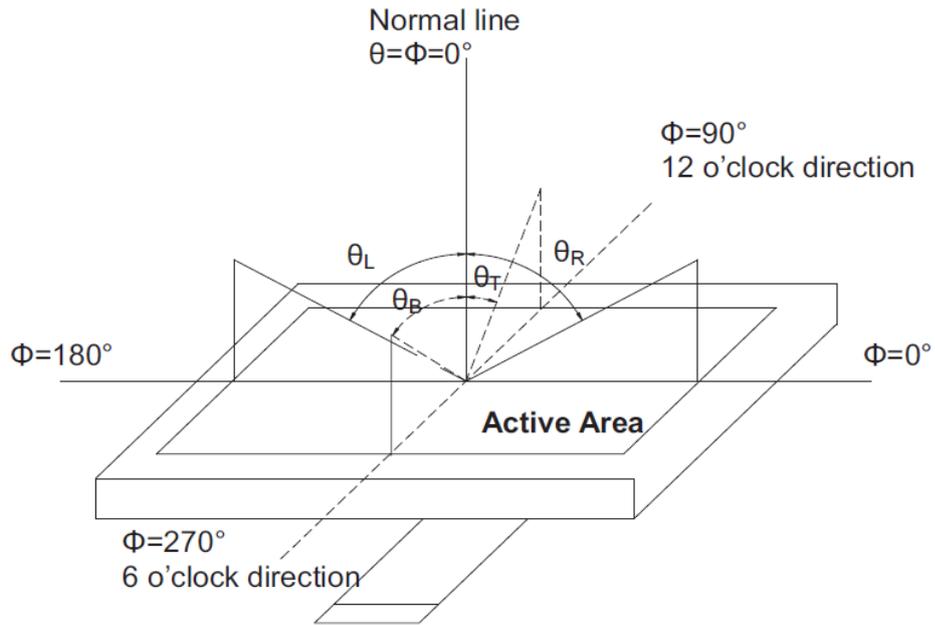
Note 3: Response time is defined as follow:

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,  $T_f$ ).



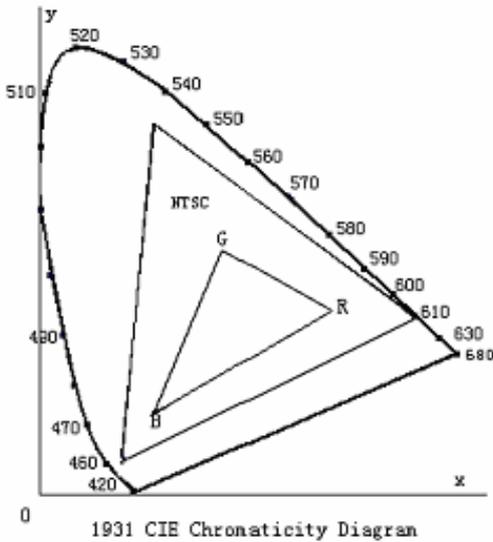
Note 4: Viewing angle range is defined as follow:

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.

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

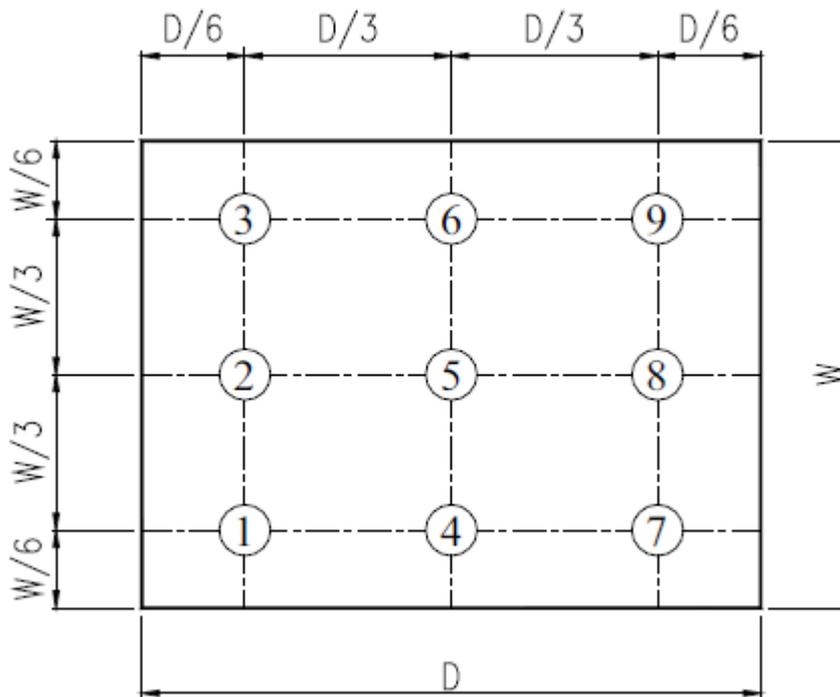
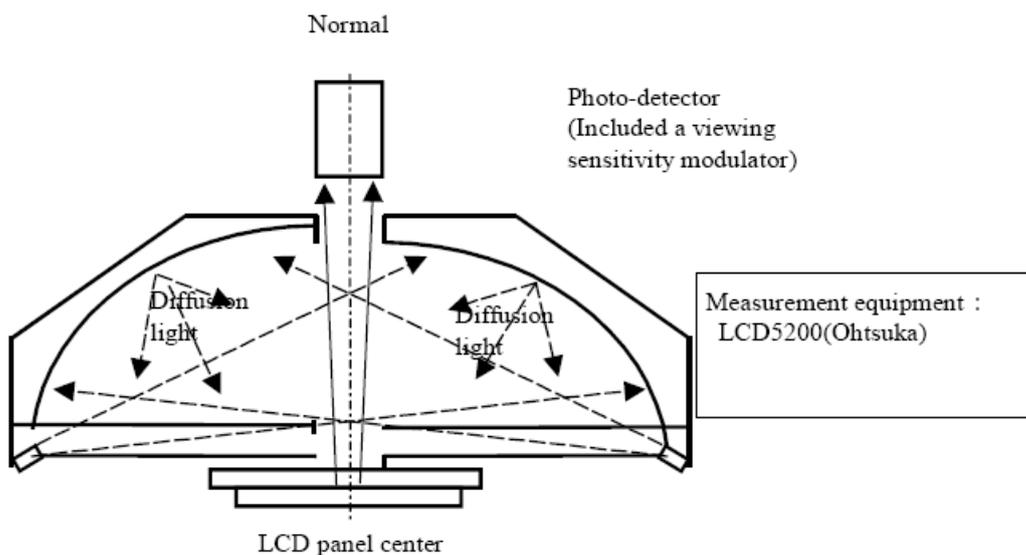


Fig. 2 Definition of uniformity

Note 8: Reflectance measurement system is defined as follow:



## 10. Environmental / Reliability Tests

No	Test Item	Condition	Judgment criteria
1	High Temp Operation	Ts=+7°C, 120hrs	Per table in below
2	Low Temp Operation	Ta=-30°C, 120hrs	Per table in below
3	High Temp Storage	Ta=+85°C, 120hrs	Per table in below
4	Low Temp Storage	Ta=-40°C, 120hrs	Per table in below
5	High Temp & High Humidity Storage	Ta=+50°C, 90% RH 120 hours	Per table in below (polarizer discoloration is excluded)
6	Thermal Shock (Non-operation)	-30°C 30 min~+70°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 2 hours for each direction of X.Y.Z.	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.

### 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.

