CUSTOMER	
MODEL	**WC320240A-FCI-N**
APPROVAL	**BY:**　　　　　　　**DATA:**

SALES BY	APPROVED BY	CHECKED BY	PREPARED BY

Contents

1.Module Classification Information

<u>W</u> <u>C</u>　　<u>3 2 0 2 4 0</u>　<u>A</u> － <u>F</u> <u>C</u> <u>I</u>　- <u>N</u>

　① ②　　　　③　　　　④　　⑤ ⑥ ⑦　　⑧

① Brand：DB LECTRO Inc.

② Display Type：H→Character Type, G→Graphic Type, C→ Color

③ Display Font：320 * 240 Dots

④ Model serials number

⑤ Backlight Type：　　　N→Without backlight

　　　　　　　　　　　B→EL, Blue green　　　　A→LED, Amber

　　　　　　　　　　　D→EL, Green　　　　　　R→LED, Red

　　　　　　　　　　　W→EL, White　　　　　　O→LED, Orange

　　　　　　　　　　　F→CCFL, White　　　　　G→LED, Green

　　　　　　　　　　　Y→LED, Yellow Green

⑥ LCD Mode：　　　　B→TN Positive, Gray　　　T→FSTN Negative

　　　　　　　　　　　N→TN Negative,　　　　　C→STN Color

　　　　　　　　　　　G→STN Positive, Gray

　　　　　　　　　　　Y→STN Positive, Yellow Green

　　　　　　　　　　　M→STN Negative, Blue

　　　　　　　　　　　F→FSTN Positive

⑦ LCD Polarize Type/　A→Reflective, N.T, 6:00　　H→Transflective, W.T,6:00

　Temperature range/　D→Reflective, N.T, 12:00　K→Transflective,

　View direction　　　G→Reflective, W. T, 6:00　　 W.T,12:00

　　　　　　　　　　　J→Reflective, W. T, 12:00　C→Transmissive, N.T,6:00

　　　　　　　　　　　B→Transflective, N.T,6:00　F→Transmissive, N.T,12:00

　　　　　　　　　　　E→Transflective, N.T.12:00　I→Transmissive, W. T, 6:00

　　　　　　　　　　　　　　　　　　　　　　　L→Transmissive, W.T,12:00

⑧ Special Code　　　　N:Without Built in negative voltage

2.Precautions in Use of LCD Module

(1)Avoid applying excessive shocks to the module or making any alterations or modifications to it.

(2)Don't make extra holes on the printed circuit board, modify its shape or change the components of LCD Module.

(3)Don't disassemble the LCM.

(4)Don't operate it above the absolute maximum rating.

(5)Don't drop, bend or twist LCM.

(6)Soldering: only to the I/O terminals.

(7)Storage: please storage in anti-static electricity container and clean environment.

3.General Specification

ITEM	STANDARD VALUE	UNIT
Number of dots	320RGB x240	dots
Outline dimension	154.6(W)x 114.8(H)x 8.5max(T)	mm
View area	118.18(W)x 89.33(H)	mm
Active area	115.18(W)x 86.33(H)	mm
Dot Size	0.09 x 0.33	mm
Dot Pitch	0.12 RGW x 0.36	mm
LCD type	FSTN Color transmissive	
View direction	6 o'clock	
Backlight	CCFL	

4.Absolute Maximum Ratings

ITEM	SYMBOL	MIN.	TYP.	MAX.	UNIT
Operating Temperature	T_{OP}	-20	—	+70	℃
Storage Temperature	T_{ST}	-20	—	+70	℃
Input Voltage	V_I	-0.3	—	V_{dd}	V
Supply Voltage For Logic	V_{DD}-V_{SS}	0	—	6.5	V
Supply Voltage For LCD	V_{LCD}-V_{SS}	0	—	30	V

5.Electrical Characteristics

ITEM	SYMBOL	CONDITION	MIN.	TYP.	MAX.	UNIT
Logic Voltage	V_{DD}-V_{SS}	—	4.75	5.0	5.25	V
Supply Voltage For LCD	V_{LCD}-V_{SS}	Ta=-20℃	—	—	—	V
		Ta=25℃	—	26.2	—	V
		Ta=70℃	—	—	—	V
Input High Volt.	V_{IH}	—	$0.8V_{DD}$	—	V_{DD}	V
Input Low Volt.	V_{IL}	—	0	—	$0.2V_{DD}$	V
Output High Volt.	V_{OH}	—	V_{DD} -0.4	—	—	V
Output Low Volt.	V_{OL}	—	—	—	0.4	V
Supply Current	I_{LCD}	—		7.5	11.0	mA

6.Optical Characteristics

ITEM	SYMBAL	CONDITION	MIN	TYP	MAX	UNIT
View Angle	(V) θ	CR$\geqq$2	10	—	105	deg.
	(H) φ	CR$\geqq$2	-30	—	30	deg.
Contrast Ratio	CR	—	—	8	—	—
Response Time	T rise	—	—	120	—	ms
	T fall	—	—	252	—	ms

6.1   Definitions

■View Angles
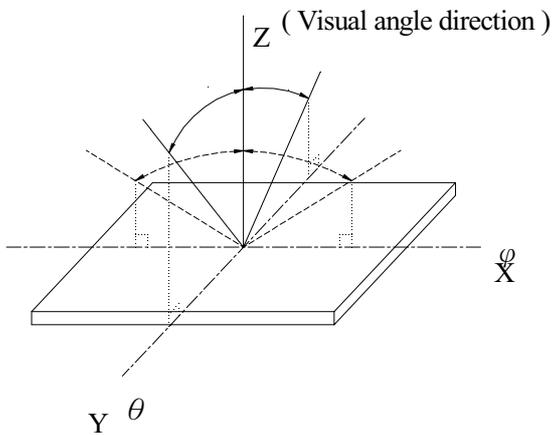
■Contrast Ratio

$$CR = \frac{\text{Brightness at selected state (BS)}}{\text{Brightness at non-selected state (Bns)}}$$
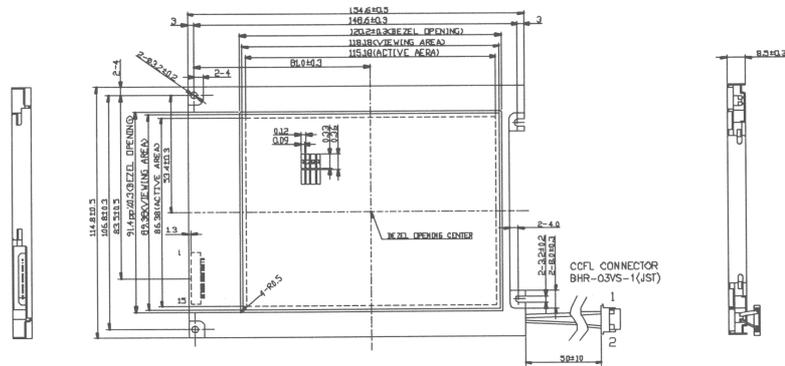
Z (Visual angle direction)

Selected state

Non-selected state

Brightness (％)

Bs

Bns

Operating voltage for LCD driving

φ
X

Y θ

■Response time

Nonselected Condition   Selected Condition   Nonselected Condition

Brightness

100 ％

10 ％

90 ％

tr

Rise Time

td

Decay Time (fall time tf)
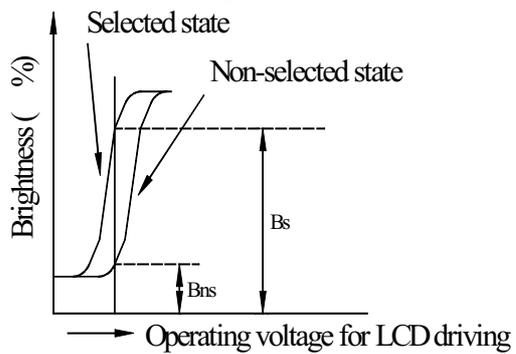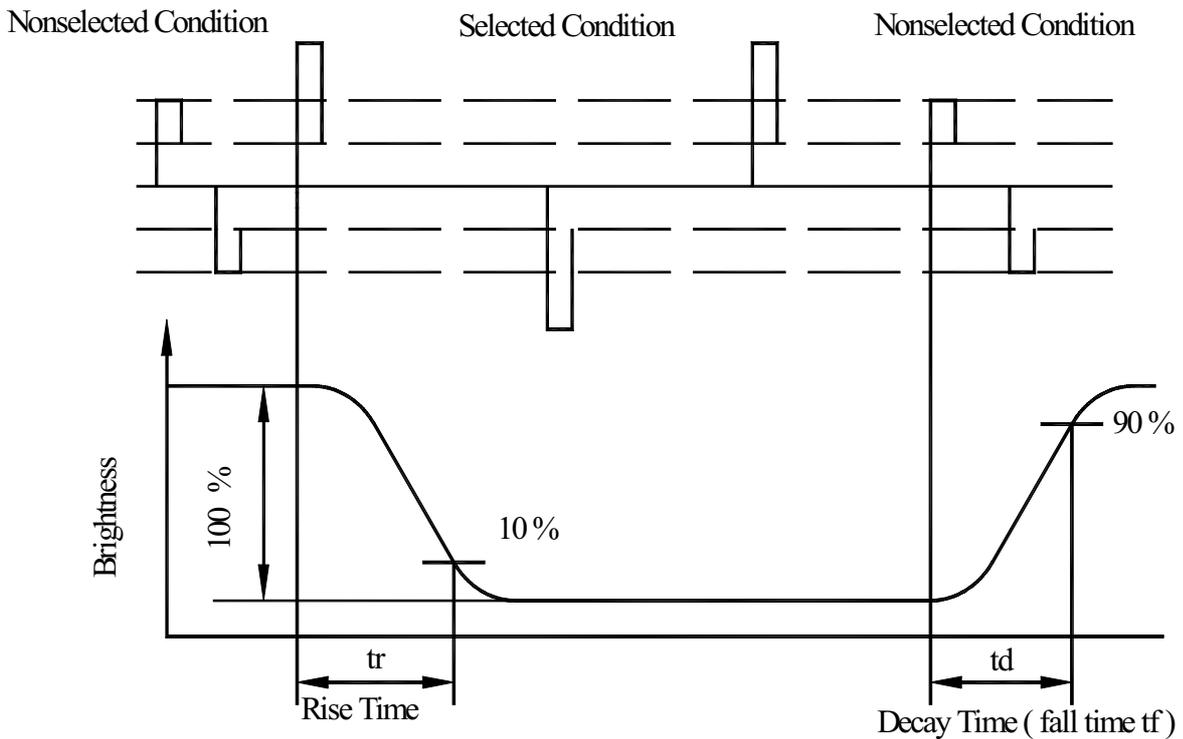
7. Interface Description

Pin No.	Symbol	Level	Description
1	FRM	H	SCAN START-UPSINGAL
2	CL1	H to L	Data latch pulse
3	CL2	H to L	Data shift pulse
4	DISP	H/L	H: Display ON, L: Display OFF
5	V_{DD}	5.0V	Power supply for Logic
6	V_{SS}	0V	Ground
7	V_{LCD}	(Variable)	Driving voltage for LCD
8	D7	H/L	Display data
9	D6	H/L	Display data
10	D5	H/L	Display data
11	D4	H/L	Display data
12	D3	H/L	Display data
13	D2	H/L	Display data
14	D1	H/L	Display data
15	D0	H/L	Display data

LCD Connector : MOLEX53261-1510

8.Contour Drawing & Block diagram

NOTES: 1.RESOLUTION : 320RGB X 240 DOTS
2.BACKLIGHT COLOR : WHITE(CCFL)
3.TOLERANCE NO SPECIFIED : ±0.5mm
4.Matching Connector :
    51021-1500(Molex)
    SM02-(8.0)B-BHS-1(JST)

2)INTERFACE CONNECTOR PIN
LAYOUT,MOLEX 53261-1510

Pin No.	Pin Name
1	FRM
2	LOAD
3	CP
4	DISP
5	VDD
6	VSS
7	VEE
8	D7
9	D6
10	D5
11	D4
12	D3
13	D2
14	D1
15	D0

1	Lead Type	COLOR R,G,B
2	Viewing Direction	6 O'CLOCK
3	Drive Method	1/240 DUTY 1/17 BIAS
4	Operating Temperature	-20℃~70℃
5	Storage Temperature	-30℃~80℃
6	Frame	70Hz
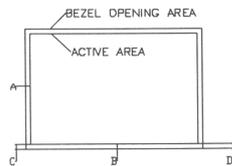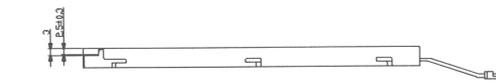
1> TOLERANCE X-DIRECTION A=2.51±0.6
2> TOLERANCE Y-DIRECTION B=2.51±0.6
3> OBLIQUITY OF DISPLAY AREA (C-D)<0.6

LP*240pulses

FRM

CL1

D0
|
D7

1st line' data   2nd line's data   240th line's data   1st line's data

XCK *320(3/8)pulses

CL1

CL2

CL2

D7	R(1,1)	B(1,3)	G(1,6)		B(1,315)	G(1,318)
D6	G(1,1)	R(1,4)	B(1,6)		R(1,316)	B(1,318)
D5	B(1,1)	G(1,4)	R(1,7)		G(1,316)	R(1,319)
D4	R(1,2)	B(1,4)	G(1,7)		B(1,316)	G(1,319)
D3	G(1,2)	R(1,5)	B(1,7)		R(1,317)	B(1,319)
D2	B(1,2)	G(1,5)	R(1,8)		G(1,317)	R(1,320)
D1	R(1,3)	B(1,5)	G(1,8)		B(1,317)	G(1,320)
D0	G(1,3)	R(1,6)	B(1,8)		R(1,318)	B(1,320)

9.Timing Characteristics

9.1.Common & Segment interface timing:

ITEM	symbol	Test Condition	Min.	Typ.	Max.	Units
Clock Cycle	tC	Fig.1	500	—	—	ns
CP Pulse Width	tWC	Fig.1	240	—	—	ns
LP Pulse Width	tWL	Fig.1	240	—	—	ns
Data Set Up Time	tDSU	Fig.1	240	—	—	ns
Data Hold Time	tDHD	Fig.1	240	—	—	ns
CP Rise/Fall Time	tr,tf	Fig.1	—	—	50	ns
CP to LOAD	tCL	Fig.1	240	—	—	ns
LOAD to CP	tLC	Fig.1	240	—	—	ns
LP Pulse Width	tLW	Fig.1	240	—	—	ns
CL1 Pulse Width	tCW	Fig.2	170	—	—	ns
Data Set Up Time	tDSU2	Fig.2	240	—	—	ns
Data Hold Time	tDHD2	Fig.2	170	—	—	ns
CL1 Rise/Fall Time	tr2,tf2	Fig.2	—	—	50	ns
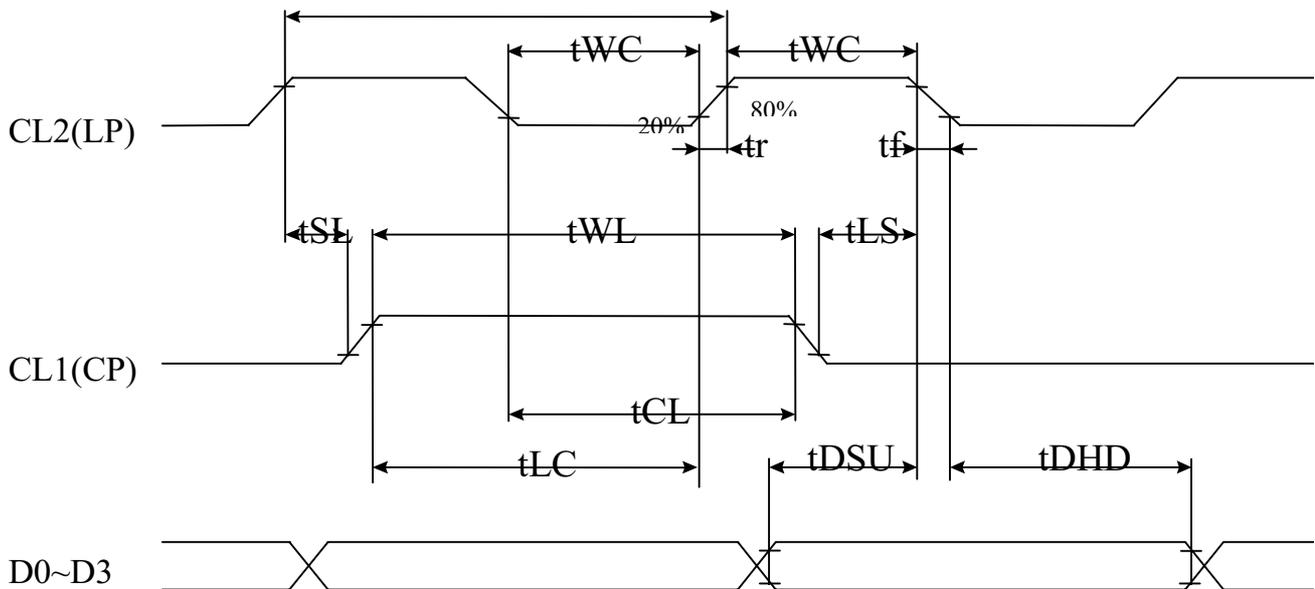
Fig 1. SEGMENT TIMING
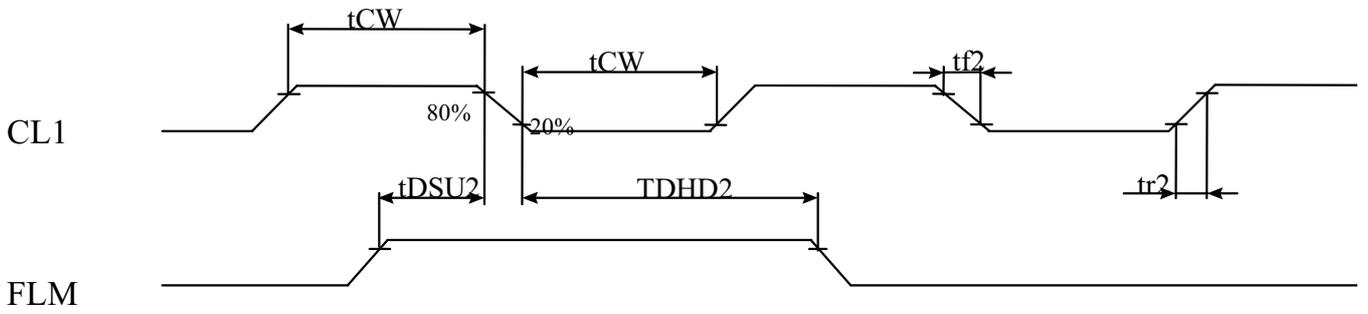
Fig 2 COMMON TIMING

9.2 POWER ON/OFF TIMING
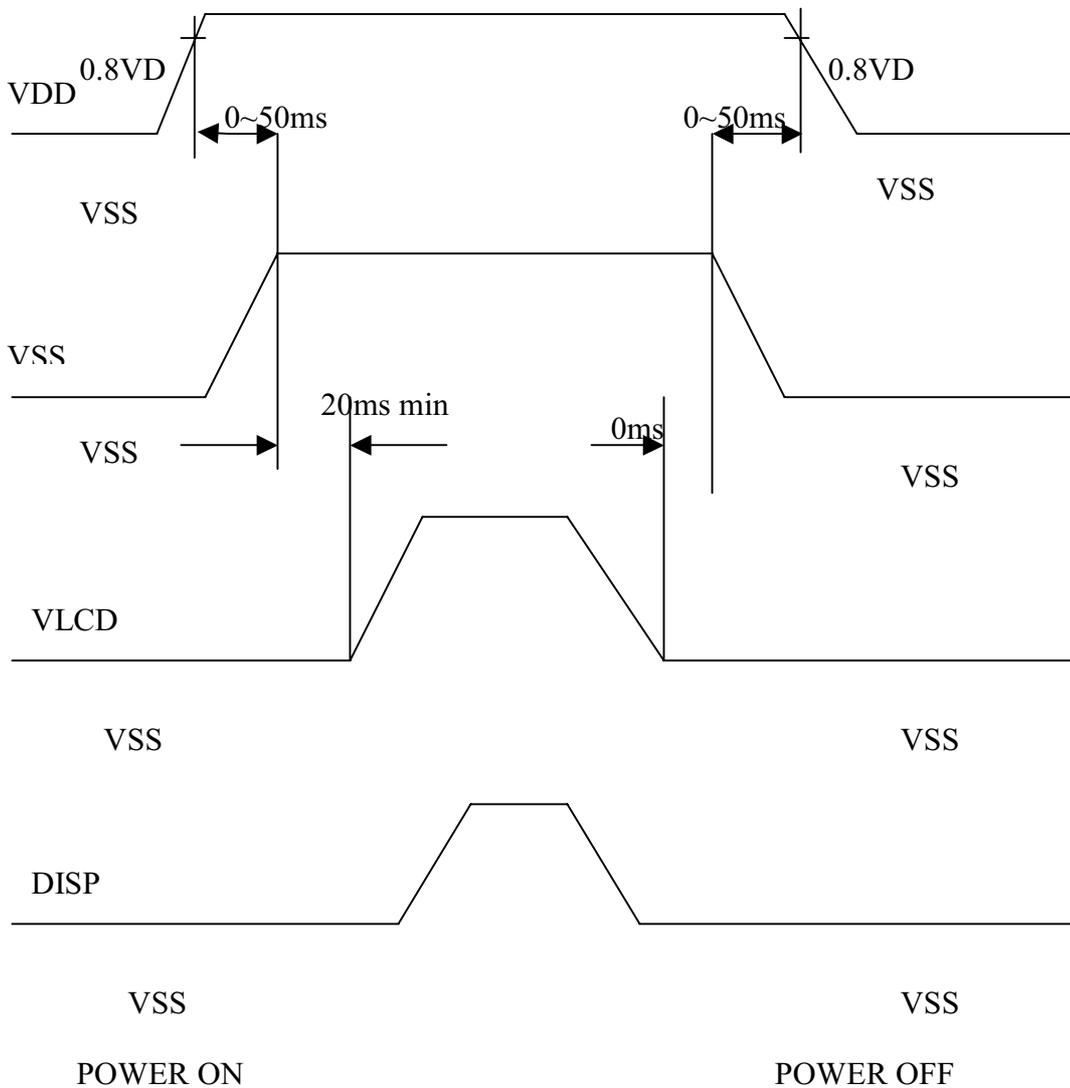
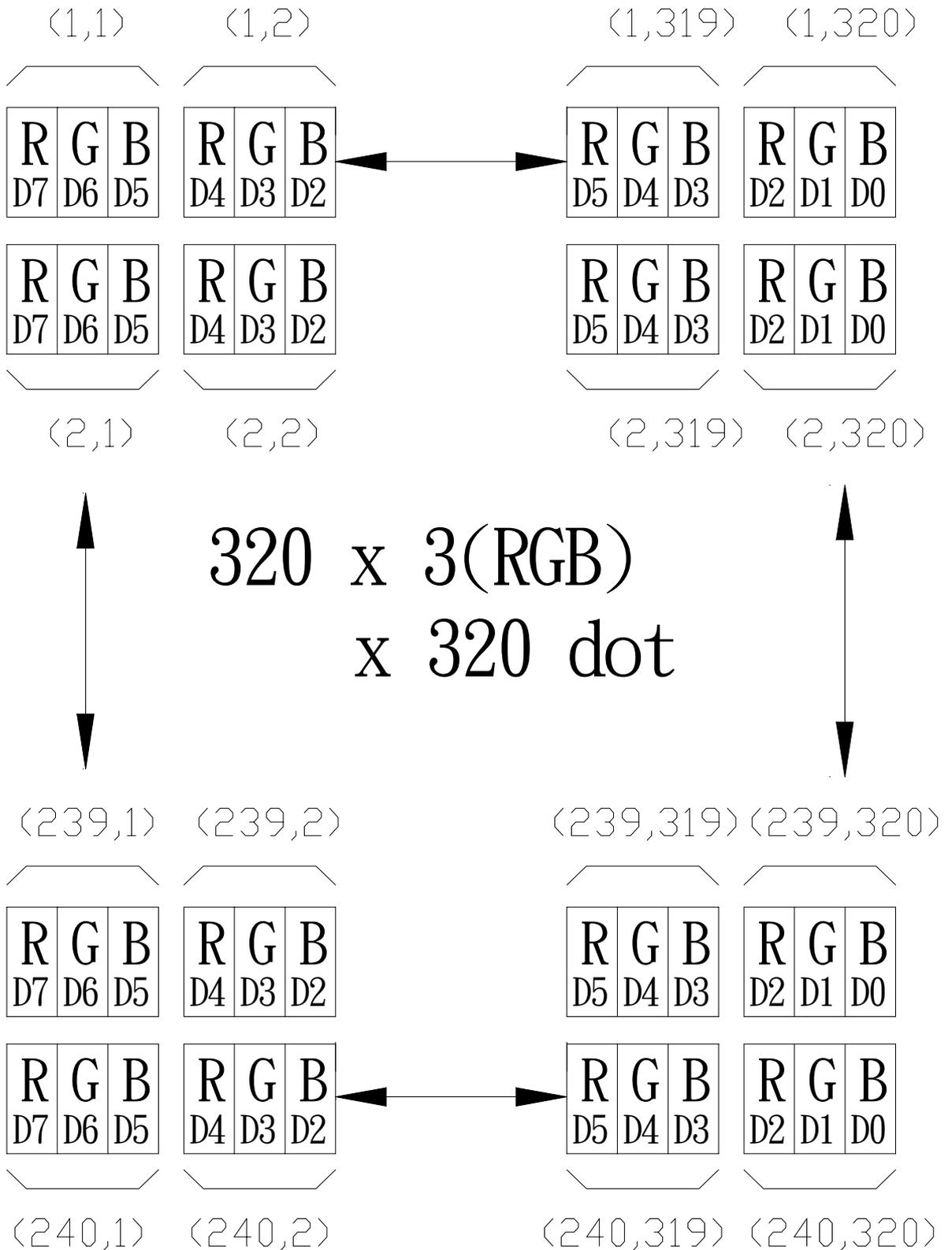The missing pixels may occur when the LCM is driven beyond above power interface timing sequence.

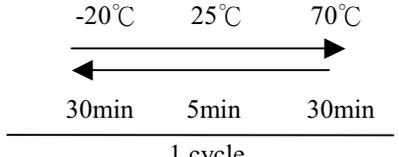# 10.POWER SUPPLY
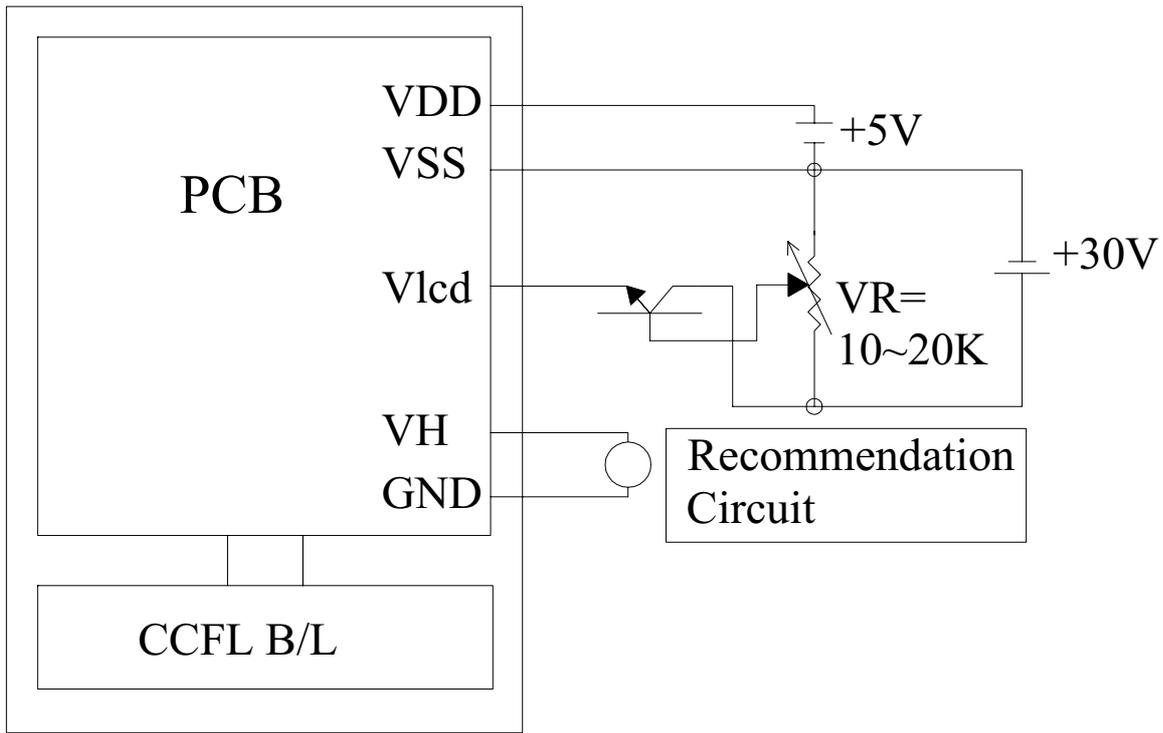
11.DISPLAY PATTERN

segment

common

| | ⟨1,1⟩ | ⟨1,2⟩ | ⟨1,319⟩ | ⟨1,320⟩ |

320 x 3(RGB)
x 320 dot

12. Quality Assurance

◆ Screen Cosmetic Criteria

No.	Defect	Judgement Criterion	Partition
1	Spots	A)Clear Size: d mm Acceptable Qty in active area d ≦0.1 Disregard 0.1<d≦0.2 6 0.2<d≦0.3 2 0.3<d 0 Note: Including pin holes and defective dots which must be within one pixel size. B)Unclear Size: d mm Acceptable Qty in active area d ≦0.2 Disregard 0.2<d≦0.5 6 0.5<d≦0.7 2 0.7<d 0	Minor
2	Bubbles in Polarize	Size: d mm Acceptable Qty in active area d≦0.3 Disregard 0.3<d≦1.0 3 1.0<d≦1.5 1 1.5<d 0	Minor
3	Scratch	In accordance with spots cosmetic criteria. When the light reflects on the panel surface, the scratches are not to be remarkable.	Minor
4	Allowable Density	Above defects should be separated more than 30mm each other.	Minor
5	Coloration	Not to be noticeable coloration in the viewing area of the LCD panels. Back-light type should be judged with back-light on state only.	Minor

13. RELIABILITY
■ Content of Reliability Test

Environmental Test				
No.	Test Item	Content of Test	Test Condition	Applicable Standard
1	High Temperature storage	Endurance test applying the high storage temperature for a long time.	70℃ 120hrs	——
2	Low Temperature storage	Endurance test applying the high storage temperature for a long time.	-20℃ 120hrs	——
3	High Temperature Operation	Endurance test applying the electric stress (Voltage & Current) and the thermal stress to the element for a long time.	70℃ 120hrs	——
4	Low Temperature Operation	Endurance test applying the electric stress under low temperature for a long time.	-20℃ 120hrs	——
5	High Temperature/ Humidity Storage	Endurance test applying the high temperature and high humidity storage for a long time.	70℃,90%RH 96hrs	——
6	High Temperature/ Humidity Operation	Endurance test applying the electric stress (Voltage & Current) and temperature / humidity stress to the element for a long time.	70℃,90%RH 96hrs	——
7	Temperature Cycle	Endurance test applying the low and high temperature cycle. -20℃　25℃　70℃ 30min　5min　30min 1 cycle	-20℃/70℃ 10 cycles	——
Mechanical Test				
8	Vibration test	Endurance test applying the vibration during transportation and using.	10~22Hz→1.5mmp-p 22~500Hz→1.5G Total 0.5hrs	——
9	Shock test	Constructional and mechanical endurance test applying the shock during transportation.	50G Half sign wave 11 msedc 3 times of each direction	——
10	Atmospheric pressure test	Endurance test applying the atmospheric pressure during transportation by air.	115mbar 40hrs	——
Others				
11	Static electricity test	Endurance test applying the electric stress to the terminal.	VS=800V,RS=1.5kΩ CS=100pF 1 time	——

***Supply voltage for logic system=5V. Supply voltage for LCD system =Operating voltage at 25℃

14. Backlight Information

(Ta=25℃)

CCFL backlight Specification　　　　　　　　　　　　　**(Ta=25℃)**

Item	Symbol	Specification			Unit	Condition
		Min	Typ	Max		
Driving Voltage	V_{FL}	－	500	－	Vrms	－
Input current	I_{FL}	4.5	5.0	5.5	mArms	－
Power consumption	W	－	2.5	－	W	－
Starting Voltage	V_{FLS}	－	630	－	Vrms	－
Luminance	L	－	550	－	Cd/m^2	φ, θ =0 deg, I_{FL} =5.0mArms
Chromaticity	x	－	0.340	－	－	－
	y	－	0.370	－	－	－
Luminance Uniformity (Testing 9 point)	－	75%	－	－	%	φ, θ =0 deg, I_{FL} =5.0mArms
Life time	－	10000	－	－	hrs	

CCFL Connector: BHR-03VS-1(JST)