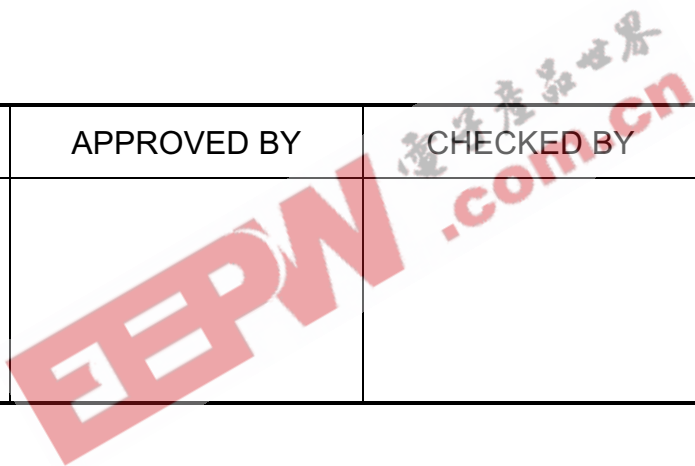


| | | |
|----------|------------------------|-------|
| CUSTOMER | | |
| MODEL | WC320240A-FCI-N | |
| APPROVAL | BY: | DATA: |

| | | | |
|----------|-------------|------------|-------------|
| SALES BY | APPROVED BY | CHECKED BY | PREPARED BY |
| | | | |



Contents

1. Module classification information
2. Precautions in Use of LCM
3. General Specification
4. Absolute Maximum Ratings
5. Electrical Characteristics
6. Optical Characteristics
7. Interface Pin Function
8. Contour Drawing & Block Diagram
9. Timing Characteristics
10. Power supply
11. Display patter
12. Quality Assurance
13. Reliability
14. Backlight Information



1. Module Classification Information

W C 3 2 0 2 4 0 A — F C I - N
 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/
 Temperature range/
 View direction

A→Reflective, N.T, 6:00

H→Transflective, W.T,6:00

D→Reflective, N.T, 12:00

K→Transflective,
 W.T,12:00

G→Reflective, W. T, 6:00

C→Transmissive, N.T,6:00

J→Reflective, W. T, 12:00

F→Transmissive, N.T,12:00

B→Transflective, N.T,6:00

I→Transmissive, W. T, 6:00

E→Transflective, N.T.12:00

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 | °C |
| Storage Temperature | T_{ST} | -20 | — | +70 | °C |
| 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 | $V_{LCD}-V_{SS}$ | $T_a=-20^{\circ}\text{C}$ | — | — | — | V |
| | | $T_a=25^{\circ}\text{C}$ | — | 26.2 | — | V |
| | | $T_a=70^{\circ}\text{C}$ | — | — | — | 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 | SYMBOL | CONDITION | MIN | TYP | MAX | UNIT |
|----------------|---------------|-------------|-----|-----|-----|------|
| View Angle | (V) θ | $CR \geq 2$ | 10 | — | 105 | deg. |
| | (H) φ | $CR \geq 2$ | -30 | — | 30 | deg. |
| Contrast Ratio | CR | — | — | 8 | — | — |
| Response Time | T rise | — | — | 120 | — | ms |
| | T fall | — | — | 252 | — | ms |

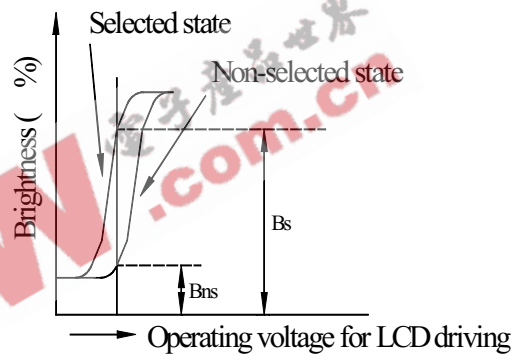
6.1 Definitions

View Angles

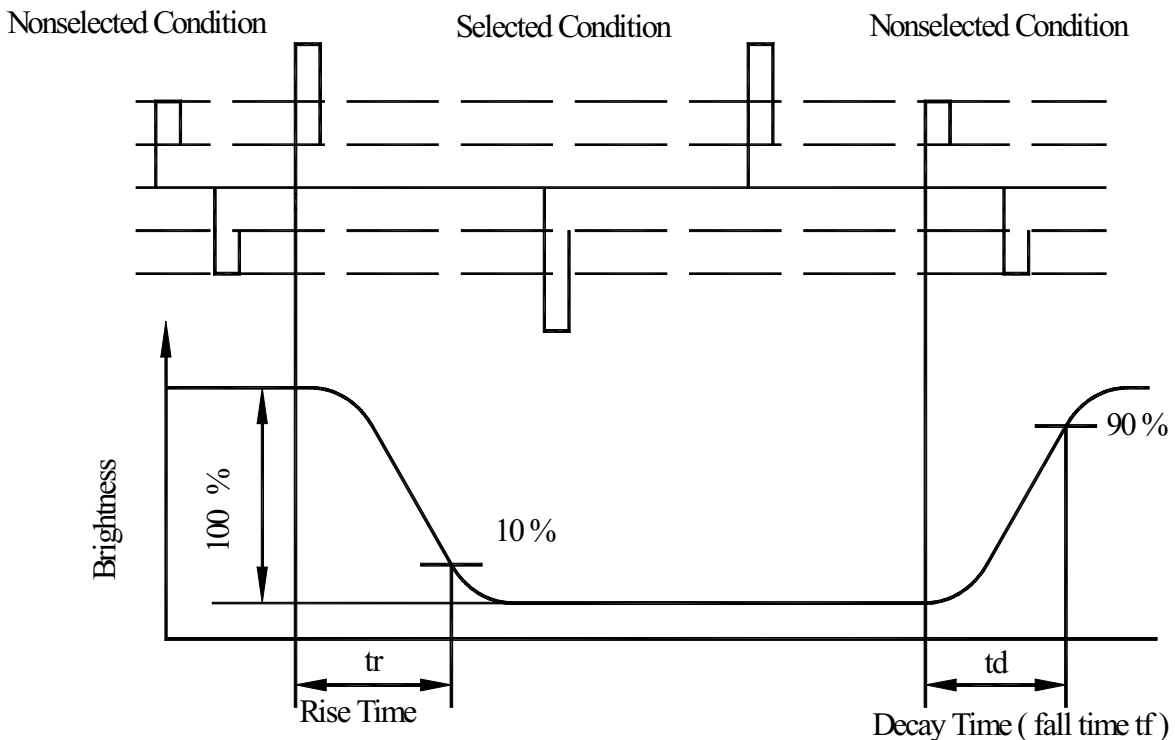


Contrast Ratio

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



Response time

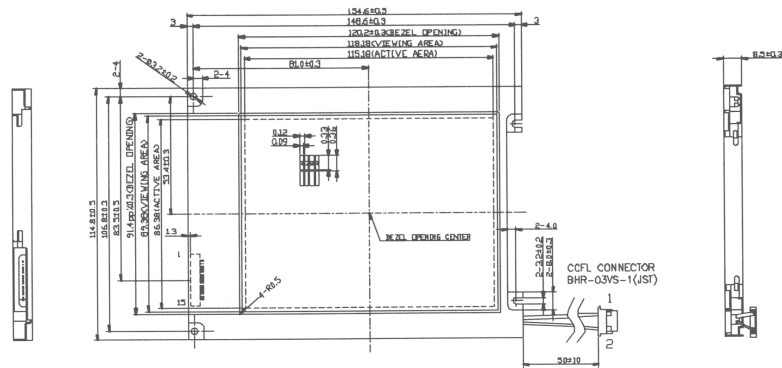


7. Interface Description

| Pin No. | Symbol | Level | Description |
|---------|------------------|------------|-------------------------------|
| 1 | FRM | H | SCAN START-UPSIGNAL |
| 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

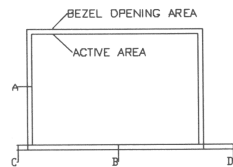
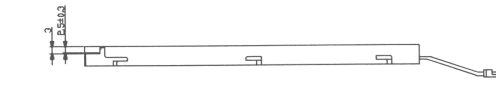
8. Contour Drawing & Block diagram



2) INTERFACE CONNECTOR PIN LAYOUT,MOLEX 53281-1510

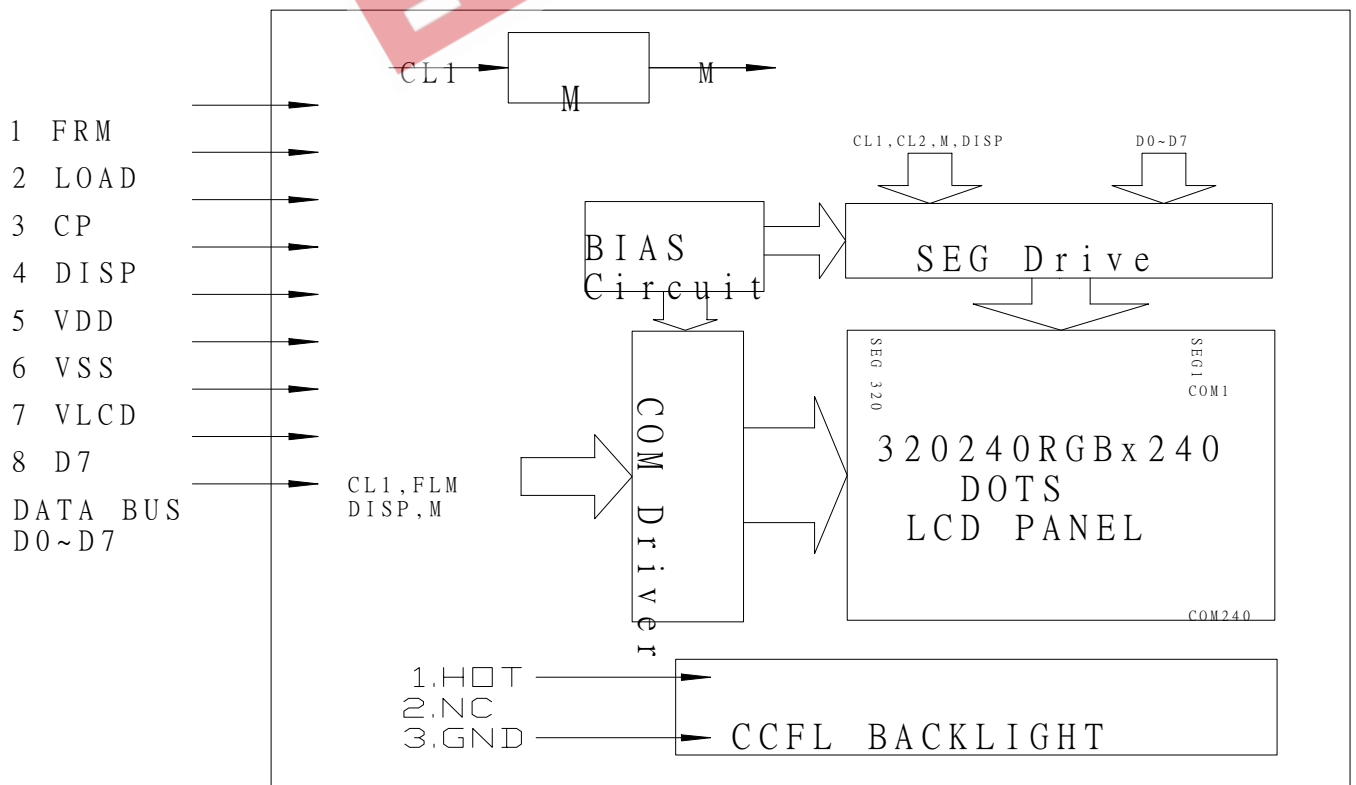
| Pin No. | Pin Name |
|---------|----------|
| 1 | FRM |
| 2 | LOAD |
| 3 | CP |
| 4 | DISP |
| 5 | VDD |
| 6 | VSS |
| 7 | VFF |
| 8 | D7 |
| 9 | D6 |
| 10 | D5 |
| 11 | D4 |
| 12 | D3 |
| 13 | D2 |
| 14 | D1 |
| 15 | DO |

| | | |
|---|-----------------------|----------------------|
| 1 | Lead Type | COLOR RGB |
| 2 | Viewing Direction | 6 O'CLOCK |
| 3 | Drive Method | 1/240 DUTY 1/17 BIAS |
| 4 | Operating Temperature | -20°C~70°C |
| 5 | Storage Temperature | -30°C~95°C |
| 6 | Frame | 7Hz |



- 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

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





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

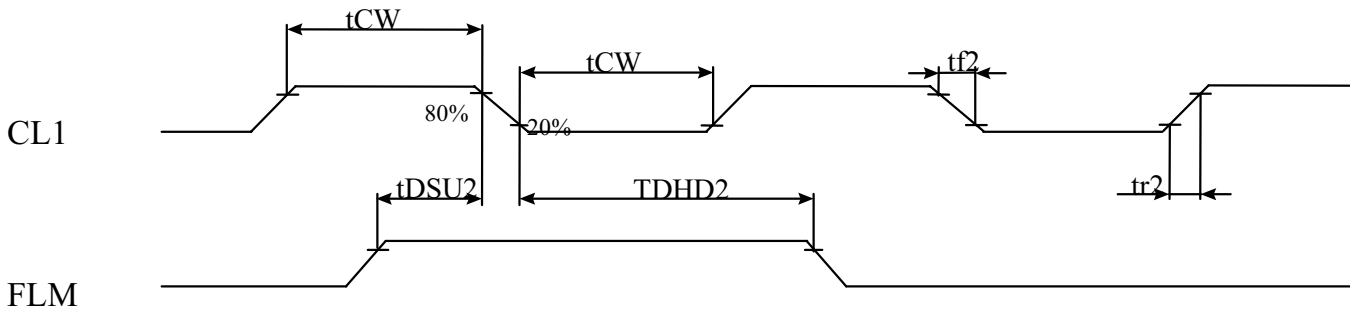
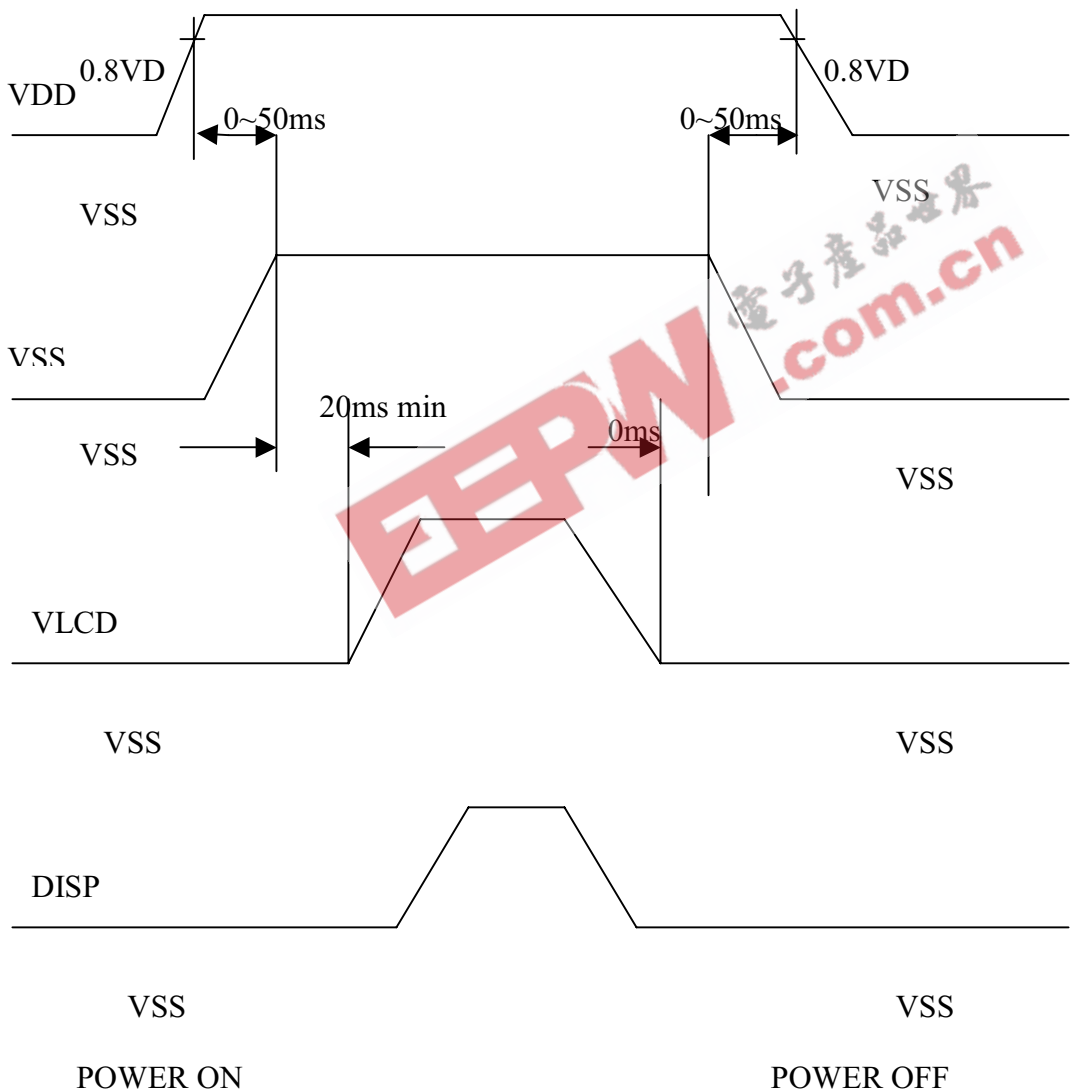


Fig 2 COMMON TIMING

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

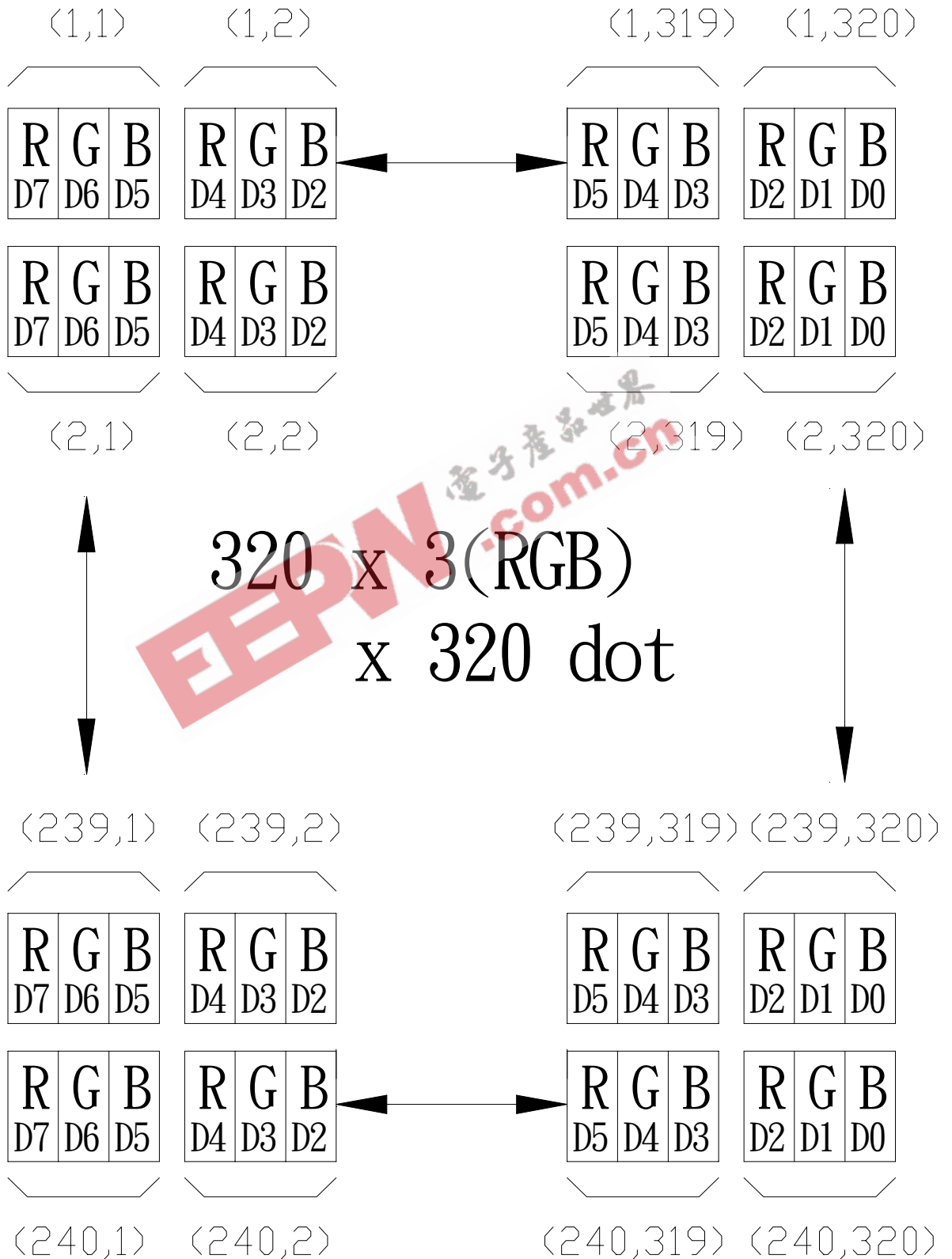


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11. DISPLAY PATTERN

segment

Common



12. Quality Assurance

◆ Screen Cosmetic Criteria

| No. | Defect | Judgement Criterion | Partition | | | | | | | | | | | | | | | | | | | | |
|--------------------|-------------------------------|--|------------|-------------------------------|--------------|-----------|--------------------|---|--------------------|---|-----------|---|------------|-------------------------------|--------------|-----------|--------------------|---|--------------------|---|-----------|---|-------|
| 1 | Spots | <p>A)Clear</p> <table border="1"> <thead> <tr> <th>Size: d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td>$d \leq 0.1$</td> <td>Disregard</td> </tr> <tr> <td>$0.1 < d \leq 0.2$</td> <td>6</td> </tr> <tr> <td>$0.2 < d \leq 0.3$</td> <td>2</td> </tr> <tr> <td>$0.3 < d$</td> <td>0</td> </tr> </tbody> </table> <p>Note: Including pin holes and defective dots which must be within one pixel size.</p> <p>B)Unclear</p> <table border="1"> <thead> <tr> <th>Size: d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td>$d \leq 0.2$</td> <td>Disregard</td> </tr> <tr> <td>$0.2 < d \leq 0.5$</td> <td>6</td> </tr> <tr> <td>$0.5 < d \leq 0.7$</td> <td>2</td> </tr> <tr> <td>$0.7 < d$</td> <td>0</td> </tr> </tbody> </table> | Size: d mm | Acceptable Qty in active area | $d \leq 0.1$ | Disregard | $0.1 < d \leq 0.2$ | 6 | $0.2 < d \leq 0.3$ | 2 | $0.3 < d$ | 0 | Size: d mm | Acceptable Qty in active area | $d \leq 0.2$ | Disregard | $0.2 < d \leq 0.5$ | 6 | $0.5 < d \leq 0.7$ | 2 | $0.7 < d$ | 0 | Minor |
| Size: d mm | Acceptable Qty in active area | | | | | | | | | | | | | | | | | | | | | | |
| $d \leq 0.1$ | Disregard | | | | | | | | | | | | | | | | | | | | | | |
| $0.1 < d \leq 0.2$ | 6 | | | | | | | | | | | | | | | | | | | | | | |
| $0.2 < d \leq 0.3$ | 2 | | | | | | | | | | | | | | | | | | | | | | |
| $0.3 < d$ | 0 | | | | | | | | | | | | | | | | | | | | | | |
| Size: d mm | Acceptable Qty in active area | | | | | | | | | | | | | | | | | | | | | | |
| $d \leq 0.2$ | Disregard | | | | | | | | | | | | | | | | | | | | | | |
| $0.2 < d \leq 0.5$ | 6 | | | | | | | | | | | | | | | | | | | | | | |
| $0.5 < d \leq 0.7$ | 2 | | | | | | | | | | | | | | | | | | | | | | |
| $0.7 < d$ | 0 | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Bubbles in Polarize | <table border="1"> <thead> <tr> <th>Size: d mm</th> <th>Acceptable Qty in active area</th> </tr> </thead> <tbody> <tr> <td>$d \leq 0.3$</td> <td>Disregard</td> </tr> <tr> <td>$0.3 < d \leq 1.0$</td> <td>3</td> </tr> <tr> <td>$1.0 < d \leq 1.5$</td> <td>1</td> </tr> <tr> <td>$1.5 < d$</td> <td>0</td> </tr> </tbody> </table> | Size: d mm | Acceptable Qty in active area | $d \leq 0.3$ | Disregard | $0.3 < d \leq 1.0$ | 3 | $1.0 < d \leq 1.5$ | 1 | $1.5 < d$ | 0 | Minor | | | | | | | | | | |
| Size: d mm | Acceptable Qty in active area | | | | | | | | | | | | | | | | | | | | | | |
| $d \leq 0.3$ | Disregard | | | | | | | | | | | | | | | | | | | | | | |
| $0.3 < d \leq 1.0$ | 3 | | | | | | | | | | | | | | | | | | | | | | |
| $1.0 < d \leq 1.5$ | 1 | | | | | | | | | | | | | | | | | | | | | | |
| $1.5 < d$ | 0 | | | | | | | | | | | | | | | | | | | | | | |
| 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°C 120hrs | — |
| 2 | Low Temperature storage | Endurance test applying the high storage temperature for a long time. | -20°C 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°C 120hrs | — |
| 4 | Low Temperature Operation | Endurance test applying the electric stress under low temperature for a long time. | -20°C 120hrs | — |
| 5 | High Temperature/ Humidity Storage | Endurance test applying the high temperature and high humidity storage for a long time. | 70°C,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°C,90%RH 96hrs | — |
| 7 | Temperature Cycle | Endurance test applying the low and high temperature cycle.  | -20°C/70°C 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 msdc 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°C

14. Backlight Information

(Ta=25°C)

CCFL backlight Specification

(Ta=25°C)

| 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 | $\varphi, \theta = 0 \text{ deg}, I_{FL} = 5.0 \text{ mArms}$ |
| Chromaticity | x | — | 0.340 | — | — | — |
| | y | — | 0.370 | — | — | — |
| Luminance Uniformity (Testing 9 point) | — | 75% | — | — | % | $\varphi, \theta = 0 \text{ deg}, I_{FL} = 5.0 \text{ mArms}$ |
| Life time | — | 10000 | — | — | hrs | |

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

